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ELEMENTS OF *AGRICULTURAL CHEMISTRY,* IN A COURSE OF LECTURES FOR THE BOARD OF AGRICULTURE;

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[This is in many respects one of the most valuable books that has for a long time come under our notice. Agriculture is the most useful of all Arts; and Chemistry the most useful of Sciences, chiefly because it professes to analyse the principles of soils, manures, and vegetation. The union of two such important branches of knowledge, under the direction of so indefatigable and acute a Philosopher as Sir HUMPHREY DAVY, promises therefore to the Art all the advantages from the Science which the world has long sanguinely expected, from the application of one to the other. Our extracts, though copious, exhibit however mere specimens of the Author's luminous mode of treating the various subjects, rather than any detail of his various discoveries and original observations, for which, in justice, we must refer our readers to the Book itself.]

IMPORTANCE OF CHEMISTRY.

IT is scarcely possible to enter upon any investigation in agriculture without finding it connected, more or less, with doctrines or elucidations derived from chemistry.

If land be unproductive, and a system of ameliorating it is to be attempted, the sure method of obtaining the object is by determining the cause of its sterility, which must necessarily depend upon some defect in the constitution of the soil, which may be easily discovered by chemical analysis.

Some lands of good apparent texture are yet sterile in a high degree; and common observation and common practice afford no means of ascertaining the cause, or of removing the effect. The application of chemical tests in such cases is obvious; for the soil must contain some noxious principle which may be easily discovered, and probably easily destroyed.

Are any of the salts of iron present? they may be decomposed by lime. Is there an excess of siliceous sand? the system of improvement must depend on the application of clay and calcareous matter. Is there a defect of calcareous matter? the remedy is obvious. Is an excess of vegetable matter indicated? it may be removed by liming, paring, and burning. Is there a deficiency of vegetable matter? it is to be supplied by manure.

A question concerning the different kinds of limestone to be employed in cultivation often occurs. To determine this fully, in the common way of experience, would demand a considerable time, perhaps some years, and trials which might be injurious to crops; but by simple chemical tests the nature of a limestone is discovered in a few minutes; and the fitness of its application, whether as a manure for different soils, or as a cement, determined.

Peat earth, of a certain consistence and composition, is an excellent manure; but there are some varieties of peats which contain so large a quantity of ferruginous matter as to be absolutely poisonous to plants. Nothing can be more simple than the chemical operation for determining the nature and the probable uses of a substance of this kind.

There has been no question on which more difference of opinion has existed, than that of the state in which manure ought to be ploughed into the land; whether recent, or when it has gone through the process of fermentation? and this question is still a subject of discussion; but whoever will refer to the simplest principles of chemistry, cannot entertain a doubt on the subject. As soon as dung begins to decompose it throws off its volatile parts, which are the most valuable and most efficient. Dung which

which has fermented, so as to become a more soft cohesive mass, has generally lost from one-third to one-half of its most useful constituent elements. It evidently should be applied as soon as fermentation begins, that it may exert its full action upon the plant, and lose none of its nutritive powers.

The value and uses of every species of agricultural produce, are most correctly estimated and applied, when practical knowledge is assisted by principles derived from chemistry. The compounds in vegetables, really nutritive as the food of animals, are very few; farina, or the pure matter of starch, gluten, vegetable jelly, and extract. Of these the most nutritive is gluten, which approaches nearest in its nature to animal matter, and which is the substance that gives to wheat its superiority over other grain. The next in order, as to nourishing power, is sugar, then farina, and last of all, gelatinous and extractive matters. Simple tests of the relative nourishing powers of the different species of food, are the relative quantities of these substances that they afford by analysis; and though taste and appearance must influence the consumption of all articles in years of plenty, yet they are less attended to in times of scarcity, and on such occasions this kind of knowledge may be of the greatest importance. Sugar and farina, or starch, are very similar in composition, and are capable of being converted into each other by simple chemical processes. In the discussion of their relations, I shall detail to you the results of some recent experiments, which will be found possessed of applications both to the economy of vegetation, and to some important processes of manufacture.

PAPULUM OF VEGETATION.

All the varieties of substances found in plants are produced from the sap, and the sap of plants is derived from water, or from the fluids in the soil, and it is altered by, or combined with, principles derived from the atmosphere. The influence of the soil, of water, and of air, will therefore be the next subject of consideration. Soils in all cases consist of a mixture of different finely divided earthy matters; with animal or vegetable substances in a state of decomposition, and certain saline ingredients. The earthy matters are the true basis of the soil; the other parts, whether natural, or artificially introduced, operate in the same manner as manures. Four earths generally abound in soils, the aluminous, the siliceous, the calcareous, and the magnesian. These earths, as I have discovered, consist of highly inflammable metals united to pure air or oxygene; and they are not, as far as we know, decomposed or altered in vegetation.

The great use of the soil is to afford support to the plant, to enable it to fix its roots, and to derive nourishment by its tubes slowly and gradually, from the soluble and dissolved substances mixed with the earths.

That a particular mixture of the earths is connected with fertility, cannot be doubted: and almost all sterile soils are capable of being improved by a modification of their earthy constituent parts. I shall describe the simplest method as yet discovered of analysing soils, and of ascertaining the constitution and chemical ingredients which appear to be connected with fertility; and on this subject many of the former difficulties of investigation will be found to be removed by recent enquiries.

The necessity of water to vegetation, and the luxuriancy of the growth of plants connected with the presence of moisture in the southern countries of the old continent, led to the opinion so prevalent in the early schools of philosophy, that water was the great productive element, the substance from which all things were capable of being composed, and into which they were finally resolved. The "αριστον μεν ὑδωρ" of the poet, "water is the noblest," seems to have been an expression of this opinion, adopted by the Greeks from the Egyptians, taught by Thales, and revived by the alchemists in late times. Van Helmont, in 1610, conceived that he had proved, by a decisive experiment, that all the products of vegetables were capable of being generated from water. His results were shown to be fallacious by Woodward in 1691; but the true use of water in vegetation was unknown till 1785; when Mr. Cavendish made the grand discovery that it was composed of two elastic fluids or gases, inflammable gas or hydrogene, and vital gas or oxygene.

Air, like water, was regarded as a pure element by most of the ancient philosophers: a few of the chemical enquirers in the sixteenth and seventeenth centuries formed some happy conjectures respecting its real nature. Sir Kenelm Digby, in 1660, supposed that it contained some saline matter, which was an essential food of plants. Boyle, Hooke, and Mayow, between 1665 and 1680, stated, that a small

small part of it only was consumed in the respiration of animals, and in the combustion of inflammable bodies; but the true statical analysis of the atmosphere is comparatively a recent labour, atchieved towards the end of the last century by Scheele, Priestley, and Lavoisier. These celebrated men showed that its principal elements are two gases, oxygene and azote, of which the first is essential to flame, and to the life of animals, and that it likewise contains small quantities of aqueous vapour, and of carbonic acid gas; and Lavoisier proved that this last body is itself a compound elastic fluid, consisting of charcoal dissolved in oxygene.

MANURES.

The theory of the general operation of the more compound manures may be rendered very obvious by simple chemical principles; but there is still much to be discovered with regard to the best methods of rendering animal and vegetable substances soluble; with respect to the processes of decomposition, how they may be accelerated or retarded, and the means of producing the greatest effects from the materials employed: these subjects will be attended to in the Lecture on Manures.

Plants are found by analysis to consist principally of charcoal and aeriform matter. They give out by distillation volatile compounds, the elements of which are pure air, inflammable air, coally matter, and azote, or that elastic substance which forms a great part of the atmosphere, and which is incapable of supporting combustion. These elements they gain either by their leaves from the air, or by their roots from the soil. All manures from organized substances contain the principles of vegetable matter, which during putrefaction are rendered either soluble in water or aeriform—and in these states they are capable of being assimilated to the vegetable organs. No one principle affords the pabulum of vegetable life; it is neither charcoal nor hydrogene, nor azote nor oxygene alone; but all of them together in various states and various combinations. Organic substances, as soon as they are deprived of vitality, begin to pass through a series of changes, which ends in their complete destruction, in the entire separation and dissipation of the parts. Animal matters are the soonest destroyed by the operation of air, heat, and light. Vegetable substances yield more slowly, but finally obey the same laws. The periods of the application of manures from decomposing animal and vegetable substances depend upon the knowledge of these principles, and I shall be able to produce some new and important facts founded upon them, which I trust will remove all doubt from this part of agricultural theory.

The chemistry of the more simple manures, the manures which act in very small quantities, such as gypsum, alkalies, and various saline substances, has hitherto been exceedingly obscure. It has been generally supposed that these materials act in the vegetable œconomy in the same manner as condiments or stimulants in the animal œconomy, and that they render the common food more nutritive.—It seems, however, a much more probable idea that they are actually a part of the true food of plants, and that they supply that kind of matter to the vegetable fibre, which is analogous to the bony matter in animal structures.

LIME.

Slacked lime was used by the Romans for manuring the soil in which fruit trees grew. This we are informed by Pliny. Marle had been employed by the Britons and the Gauls from the earliest times, as a top dressing for land. But the precise period in which burnt lime first came into general use in the cultivation of land, is, I believe, unknown. The origin of the application, from the early practices, is sufficiently obvious; a substance which had been used with success in gardening, must have been soon tried in farming; and in countries where marle was not to be found, calcined limestone would be naturally employed as a substitute.

The elder writers on agriculture had no correct notions of the nature of lime, limestone, and marle, or of their effects; and this was the necessary consequence of the imperfection of the chemistry of the age. Calcareous matter was considered by the alchemists as a peculiar earth, which in the fire became combined with inflammable acid; and Evelyn and Hartlib, and, still later, Lisle, in their works on husbandry, have characterized it merely as a hot manure, of use in cold lands. It is to Dr. Black, of Edinburgh, that our first distinct rudiments of knowledge on the subject are owing. About the year 1755 this celebrated professor proved, by the most decisive experiments, that limestone, and all its modifications, marbles, chalks, and marles, consist principally of a peculiar earth united to an aerial acid; that the acid is given out in burning, occasioning a loss of more than

than 40 per cent., and that the lime in consequence becomes caustic.

These important facts immediately applied with equal certainty to the explanation of the uses of lime, both as a cement and as a manure. As a cement, lime applied in its caustic state acquires its hardness and durability by absorbing the aerial (or, as it has been since called, carbonic) acid, which always exists in small quantities in the atmosphere; it becomes as it were again limestone.

Chalks, calcareous marles, or powdered limestones, act merely by forming an useful earthy ingredient of the soil, and their efficacy is proportioned to the deficiency of calcareous matter, which, in larger or smaller quantities, seems to be an essential ingredient of all fertile soils, necessary perhaps to their proper texture, and as an ingredient in the organs of plants.

Burnt lime, in its first effect, acts as a decomposing agent upon animal or vegetable matter, and seems to bring it into a state on which it becomes more rapidly a vegetable nourishment; gradually, however, the lime is neutralized by carbonic acid, and converted into a substance analogous to chalk; but in this case it more perfectly mixes with the other ingredients of the soil, is more generally diffused and finely divided; and it is probably more useful to land than any calcareous substance in its natural state.

The most considerable fact made known with regard to limestone, within the last few years, is owing to Mr. Tennant. It had been long known that a particular species of limestone, found in different parts of the north of England, when applied in its burnt and slacked state to land in considerable quantities, occasioned sterility, or considerably injured the crops for many years. Mr. Tennant, in 1800, by a chemical examination of this species of limestone, ascertained that it differed from common limestones by containing magnesian earth; and, by several experiments, he proved that this earth was prejudicial to vegetation, when applied in large quantities in its caustic state. Under common circumstances the lime from the magnesian limestone is, however, used in moderate quantities upon fertile soils in Leicestershire, Derbyshire, and Yorkshire, with good effect; and it may be applied in greater quantities to soils containing very large proportions of vegetable matter. Magnesia, when combined with carbonic acid gas, seems not to be prejudicial to vegetation, and in soils rich in manure, it is speedily supplied with this principle from the decomposition of the manure.

GRAVITATION.

Gravitation has a very important influence on the growth of plants; and it is rendered probable, by the experiments of Mr. Knight, that they owe the peculiar direction of their roots and branches almost entirely to this force.

That gentleman fixed some seeds of the garden bean on the circumference of a wheel, which in one instance was placed vertically, and in the other horizontally, and made to revolve, by means of another wheel worked by water, in such a manner, that the number of the revolutions could be regulated; the beans were supplied with moisture, and were placed under circumstances favourable to germination. The greatest velocity of motion given to the weeel was such, that it performed 250 revolutions in a minute. It was found that in all cases the beans grew, and that the direction of the roots and stems was influenced by the motion of the wheel. When the centrifugal force was made superior to the force of gravitation, which was supposed to be done when the vertical wheel performed 150 revolutions in a minute, all the radicles, in whatever way they were protruded from the position of the seeds, turned their points outwards from the circumference of the wheel, and in their subsequent growth receded nearly at right angles from its axis; the germens, on the contrary, took the opposite direction, and in a few days their points all met in the centre of the wheel.

When the centrifugal force was made merely to modify the force of gravitation in the horizontal wheel, where the greatest velocity of revolution was given, the radicles pointed downwards about ten degrees below, and the germens as many degrees above the horizontal line of the wheel's motion; and the deviation from the perpendicular was less in proportion, as the motion was less rapid.

These facts afford a rational solution of this curious problem, respecting which different philosophers have given such different opinions; some referring it to the nature of the sap, as De la Hire, others, as Darwin, to the living powers of the plant, and the stimulus of air upon the leaves, and of moisture upon the roots. The effect is now shown to be connected with mechanical causes; and there seems no other power in nature to which

which it can with propriety be referred but gravity, which acts universally, and which must tend to dispose the parts to take a uniform direction.

HEAT.

Two opinions are current respecting the nature of heat. By some philosophers it is conceived to be a peculiar subtile fluid, of which the particles repel each other, but have a strong attraction for the particles of other matter. By others it is considered as a motion or vibration of the particles of matter, which is supposed to differ in velocity in different cases, and thus to produce the different degrees of temperature. Whatever decision be ultimately made respecting these opinions, it is certain that there is matter moving in the space between us and the heavenly bodies capable of communicating heat: the motions of which are rectilineal: thus the solar rays produce heat in acting on the surface of the earth. The beautiful experiments of Dr. Herschel have shown that there are *rays* transmitted from the sun which do not illuminate; and which yet produce *more heat* that the *visible rays;* and Mr. Ritter and Dr. Wollaston have shown that there are *other invisible* rays distinguished by their *chemical* effects.

ELECTRICITY.

Different opinions are entertained among scientific men respecting the nature of electricity; by some the phænomena are conceived to depend upon a single subtile fluid, in excess in the bodies said to be positively electrified, in deficiency in the bodies said to be negatively electrified. A second class suppose the effects to be produced by two different fluids, called by them the vitreous fluid and the resinous fluid; and others regard them as affections or motions of matter, or an exhibition of attractive powers, similar to those which produce chemical combination and decomposition, but usually exerting their action on masses.

SAP OF TREES.

It has been shown by the experiments of Mr. Knight, and those made by other physiologists, that the sap descending through the bark, after being modified in the leaves, is the principal cause of the growth of the tree; thus, if the bark is wounded, the principal formation of new bark is on the upper edge of the wound; and when the wood has been removed, the formation of new wood takes place immediately beneath the bark; yet it would appear, from the late observations of M. Palisot de Beauvois, that the sap may be transferred to the bark, so as to exert its nutritive functions, independant of any general system of circulation. That gentleman separated different portions of bark from the rest of the bark in several trees, and found that in most instances the separated bark grew in the same manner as the bark in its natural state. The experiment was tried with most success on the lime-tree, the maple, and the lilac; the layers of bark were removed in August 1810, and in the spring of the next year, in the case of the maple and the lilac, small annual shoots were produced in the parts where the bark was insulated.

VEGETABLE SUBSTANCES.

The compound substances found in vegetables are, 1, gum, or mucilage, and its different modifications; 2, starch; 3, sugar; 4, albumen; 5, gluten; 6, gum elastic; 7, extract; 8, tannin; 9, indigo; 10, narcotic principle; 11, bitter principle; 12, wax; 13, resins; 14, camphor; 15, fixed oils; 16, volatile oils; 17, woody fibre; 18, acids; 19, alkalies; earths, metallic oxides, and saline compounds.

GUM.

Gum is a substance which exudes from certain trees; it appears in the form of a thick fluid, but soon hardens in the air, and becomes solid; when it is white, or yellowish white, more or less transparent, and somewhat brittle, its specific gravity varies from 1300 to 1490.

There is a great variety of gums, but the best known are gum arabic, gum senegal, gum tragacanth, and the gum of the plum or cherry tree. Gum is soluble in water, but not soluble in spirits of wine. If a solution of gum be made in water, and spirits of wine or alcohol be added to it, the gum separates in the form of white flakes. Gum can be made to inflame only with difficulty; much moisture is given off in the process, which takes place with a dark smoke and feeble blue flame, and a coal remains.

MUCILAGE.

Mucilage must be considered as a variety of gum; it agrees with it in its most important properties, but seems to have less attraction for water. According to Hermbstadt, when gum and mucilage are dissolved together in water, the mucilage may be separated by means of sulphuric acid—mucilage may be procured from linseed, from the bulbs of the hyacinth, from the leaves of the marsh-mallows; from

from several of the lichens, and from many other vegetable substances.

From the analysis of M. M. Gay Lussac and Thenard, it appears that gum arabic contains in 100 parts:

Of carbon	- -	42,23
— oxygene	- -	50,84
— hydrogene	-	6,93

with a small quantity of saline and earthy matter.

This estimation agrees very nearly with the definite proportions of 11 of carbon, 10 of oxygene, and 20 of hydrogene.

STARCH.

Starch is procured from different vegetables, but particularly from wheat or from potatoes. To make starch from wheat, the grain is steeped in cold water till it becomes soft, and yields a milky juice by pressure; it is then put into sacks of linen, and pressed in a vat filled with water: as long as any milky juice exudes the pressure is continued; the fluid gradually becomes clear, and a white powder subsides, which is starch.

Starch forms a principal part of a number of esculent vegetable substances. Sowans, cassava, salop, sago, all of them owe their nutritive powers principally to the starch they contain.

SUGAR.

It appears from the experiments of Proust, Achard, Goettling, and Parmentier, that there are many different species of sugar ready formed in the vegetable kingdom. The sugar which most nearly resembles that of the cane is extracted from the sap of the American maple, *Acer saccharinum*. This sugar is used by the North American farmers, who procure it by a kind of domestic manufacture. The trunk of the tree is bored early in spring, to the depth of about two inches; a wooden spout is introduced into the hole; the juice flows for about five or six weeks. A common sized tree, that is, a tree from two to three feet in diameter, will yield about 200 pints of sap, and every 40 pints of sap afford about a pound of sugar. The sap is neutralized by lime, and deposits crystals of sugar by evaporation.

The *sugar of grapes* has been lately employed in France as a substitute for colonial sugar. It is procured from the juice of ripe grapes by evaporation, and the action of pot-ashes; it is less sweet than common sugar, and its taste is peculiar: it produces a sensation of cold while dissolving in the mouth; and it is probable contains a larger proportion of water, or its elements.

The roots of the beet (*Beta vulgaris et cicla,*) afford a peculiar sugar by boiling, and the evaporation of the extract: it agrees in its general properties with the sugar of grapes, but has a slightly bitter taste.

Manna, a substance which exudes from various trees, particularly from the *Fraxinus Ornus*, a species of ash, which grows abundantly in Sicily and Calabria, may be regarded as a variety of sugar, very analogous to the sugar of grapes. A substance analogous to manna has been extracted by Fourcroy and Vauquelin, from the juice of the common onion (*Allium Cepa*).

Sugar has been extracted from the following vegetable substances.

The sap of the Birch (*Betula alba*), of the Sycamore (*Acer Pseudoplatanus*), of the Bamboo (*Arundo Bambos*), of the Maize (*Zea Mays*), of the Cow Parsnip (*Heracleum Sphondylium*), of the Cocoanut tree (*Cocos nucifera*), of the Walnut tree (*Juglans alba*), of the American Aloe (*Agave mericana*), of the Dulse (*Fucus palmatus*), of the Common Parsnip (*Pastinica sativa*), of St. John's bread (*Ceratonia Siliqua*), the fruit of the Common Arbutus (*Arbutus Unedo*), and other sweet-tasted fruits; the roots of the Turnip (*Brassica Rapa*), of the Carrot (*Daucus Carota*), of Parsley (*Apium petroselinum*), the flower of the Euxine Rhododendron (*Rhododendron ponticum*), and from the nectarium of most other flowers.

GLUTEN.

Gluten may be obtained from wheaten flour by the following process: the flour is to be made into a paste, which is to be cautiously washed, by kneading it under a small stream of water, till the water has carried off from it all the starch; what remains is gluten. It is a tenacious, ductile, elastic substance. It has no taste. By exposure to air it becomes of a brown colour. It is very slightly soluble in cold water; but not soluble in alcohol. When a solution of it in water is heated, the gluten separates in the form of yellow flakes; in this respect it agrees with albumen, but differs from it in being infinitely less soluble in water. The solution of albumen does not coagulate when it contains much less than 1000 parts of albumen; but it appears that gluten requires more than 1000 parts of cold water for its solution.

Gluten when burnt affords similar products to albumen, and probably differs very little from it in composition. Gluten

ten is found in a great number of plants; Proust discovered it in acorns, chesnuts, horse chesnuts, apples, and quinces; barley, rye, peas, and beans; likewise in the leaves of rue, cabbage, cresses, hemlock, borage, saffron, in the berries of the elder, and in the grape. Gluten appears to be one of the most nutritive of the vegetable substances; and wheat seems to owe its superiority to other grain, from the circumstance of its containing it in larger quantities.

TANNIN.

Table of Numbers, exhibiting the quantity of Tannin afforded by 480lbs. of different Barks, which express nearly their relative values.

	lbs.
Of middle sized Oak, cut in spring	29
Of Spanish Chesnut - -	21
Of Leicester Willow, large size	33
Of Elm - - - - - -	13
Of Common Willow, large -	11
Of Ash - - - - - -	16
Of Beech - - - - -	10
Of Horse Chesnut - - -	9
Of Sycamore - - - -	11
Of Lombardy Poplar - -	15
Of Birch - - - - -	8
Of Hazel - - - - -	14
Of Black Thorn - - -	16
Of Coppice Oak - - -	32
Of Oak, cut in autumn - -	21
Of Larch, cut in autumn -	8
Layers of Oak Bark - -	72

The quantity of the tanning principle in barks differs in different seasons; when the spring has been very cold the quantity is smallest. On an average, 4 or 5lbs. of good oak bark are required to form 1lb. of leather. The inner cortical layers in all barks contain the largest quantity of tannin. Barks contain the greatest proportion of tannin at the time the buds begin to open—the smallest quantity in winter.

WAX.

Wax is found in a number of vegetables; it is procured in abundance from the berries of the wax myrtle (*Myrica cerifera*), it may be likewise obtained from the leaves of many trees; in its pure state it is white. Its specific gravity is 9,662; it melts at 155 degrees; it is dissolved by boiling alcohol, but it is not acted upon by cold alcohol; it is insoluble in water; its properties as a combustible body are well known.

The wax of the vegetable kingdom seems to be precisely of the same nature as that afforded by the bee.

From the experiments of M. M. Gay Lussac and Thenard, it appears that 100 parts of wax, consist of

Carbon	- -	81,784
Oxygene	- -	5,544
Hydrogene	- -	12,672

FIXED OIL.

Fixed oil is obtained by expression from seeds and fruits; the olive, the almond, linseed, and rape-seed, afford the most common vegetable fixed oils. The properties of fixed oils are well known. Their specific gravity is less than that of water; that of olive and of rape seed oil is 913; that of linseed and almond oil 932; that of palm oil 968; that of walnut and beech mast oil 923. Many of the fixed oils congeal at a lower temperature than that at which water freezes. They all require for their evaporation a higher temperature than that at which water boils. The products of the combustion of oil are water, and carbonic acid gas.

From the experiments of Gay Lussac and Thenard, it appears that olive oil contains, in 100 parts,

Carbon	- -	77,213
Oxygene	- -	9,427
Hydrogene	- -	13,360

The following is a list of fixed oils, and of the trees that afford them.

Olive oil, from the Olive tree (*Olea Europea*), Linseed oil, from the common and perennial Flax (*Linum usitatissimum et perenne*), Nut oil, from the Hasel nut, (*Coryllus avellana*), Walnut (*Juglans regia*), Hemp oil, from the Hemp (*Cannabis sativa*), Almond oil, from the sweet Almond (*Amygdalus communis*), Beech oil, from the common Beech (*Fagus sylvatica*), Rape-seed oil, from the Rapes (*Brassica napus et campestris*), Poppy-oil, from the Poppy (*Papaver somniferum*), oil of Sesamum, from the Sesamum (*Sesamum orientale*), Cucumber oil, from the Gourds (*Cucurbita pepo et malapepo*), oil of Mustard, from the Mustard (*Sinapis nigra et arvensis*), oil of Sunflower, from the annual and perennial Sunflower (*Helianthus annuus et perennis*), Castor-oil, from the Palma Christi (*Ricinus communis*), Tobacco-seed oil, from the Tobacco (*Nicotiana tabacum et rustica*), Plum-kernel oil, from the Plum tree (*Prunus domestica*), Grape-seed oil, from the Vine (*Vitis vinifera*), Butter of Cacoa, from the Cacoa tree (*Theobroma cacao*), Laurel oil, from the sweet Bay tree (*Laurus nobilis*).

The fixed oils are very nutritive substances; they are of great importance in their applications to the purposes of life. Fixed oil, in combination with soda, forms

forms the finest kind of hard soap. The fixed oils are used extensively in the mechanical arts, and for the preparation of pigments and varnishes.

VOLATILE OIL.

Volatile oil, likewise called *essential oil*, differs from fixed oil, in being capable of evaporation by a much lower degree of heat, in being soluble in alcohol, and in possessing a very slight degree of solubility in water.

There is a great number of volatile oils, distinguished by their smell, their taste, their specific gravity, and other sensible qualities. A strong and peculiar odour may however be considered as the great characteristic of each species; the volatile oils inflame with more facility than the fixed oils, and afford by their combustion different proportions of the same substances, water, carbonic acid, and carbon.

The peculiar odours of plants seem, in almost all cases, to depend upon the peculiar volatile oils they contain. All the perfumed distilled waters owe their peculiar properties to the volatile oils they hold in solution. By collecting the aromatic oils, the fragrance of flowers, so fugitive in the common course of nature, is, as it were, embodied and made permanent.

CHARCOAL.

The following table contains the results of experiments made by Mr. Mushet, on the quantity of charcoal afforded by different wood.

100 *parts of*—		
Lignum Vitæ	26,8	of charcoal
Mahogany	25,4	
Laburnum	24,5	
Chesnut	23,2	
Oak	22,6	
American black Beech	21,4	
Walnut	20,6	
Holly	19,9	
Beech	19,9	
American Maple	19,9	
Elm	19,5	
Norway Pine	19,2	

ACIDS.

The acids found in the vegetable kingdom are numerous; the true vegetable acids which exist ready formed in the juices or organs of plants, are, the *oxalic, citric, tartaric, benzoic, acetic, malic, gallic*, and *prussic* acid.

All these acids, except the acetic, malic, and prussic acids, are white crystallized bodies. The acetic, malic, and prussic acids, have been obtained in the only fluid state; they are all more or less soluble in water; all have a sour taste, except the gallic and prussic acids; of which the first has an astringent taste, and the latter a taste like that of bitter almonds.

The oxalic acid exists, uncombined, in the liquor which exudes from the Chich pea (*Cicer arietinum*), and may be procured from wood sorrel (*Oxalis acetosella*), common sorrel, and other species of Rumex; and from the *Geranium acidum*. Oxalic acid is easily discovered and distinguished from other acids by its property of decomposing all calcareous salts, and forming with lime a salt insoluble in water; and by its crystallizing in four-sided prisms.

The citric acid is the peculiar acid existing in the juice of lemons and oranges. It may likewise be obtained from the cranberry, whortleberry, and hip.

Citric acid is distinguished by its forming a salt insoluble in water with lime; but decomposable by the mineral acids.

The tartaric acid may be obtained from the juice of mulberries and grapes; and likewise from the pulp of the tamarind. It is characterized by its property of forming a difficultly soluble salt with potassa, and an insoluble salt decomposable by the mineral acids with lime.

Benzoic acid may be procured from several resinous substances by distillation; from benzoin, storax, and balsam of Tolu. It is distinguished from the other acids by its aromatic odour, and by its extreme volatility.

Malic acid may be obtained from the juice of apples, barberries, plums, elderberries, currants, strawberries, and raspberries. It forms a soluble salt with lime; and is easily distinguished by this test from the acids already named.

Acetic acid, or vinegar, may be obtained from the sap of different trees. It is distinguished from malic acid by its peculiar odour; and from the other vegetable acids by forming soluble salts with the alkalies and earths.

Gallic acid may be obtained by gently and gradually heating powdered gall-nuts, and receiving the volatile matter in a cool vessel. A number of white crystals will appear, which are distinguished by their property of rendering solutions of iron deep purple.

The vegetable prussic acid is procured by distilling laurel leaves, or the kernels of the peach, and cherry, or bitter almonds. It is characterized by its property of forming a blueish green precipitate, when a little alkali is added to it, and it is poured into solutions containing iron. It is very

very analogous in its properties to the prussic acid obtained from animal substances; or by passing ammonia over heated charcoal; but this last body forms, with the red oxide of iron, the deep, bright blue substance, called Prussian blue.

Two other vegetable acids have been found in the products of plants; the morolyxic acid in a saline exudation from the white mulberry tree, and the kinic acid in a salt afforded by Peruvian bark; but these two bodies have as yet been discovered in no other cases. The phosphoric acid is found free in the onion; and the phosphoric, sulphuric, muriatic, and nitric acids, exist in many saline compounds in the vegetable kingdom; but they cannot with propriety be considered as vegetable products. Other acids are produced during the combustion of vegetable compounds, or by the action of nitric acid upon them; they are the camphoric acid, the mucous or saclactic acid, and the suberic acid; the first of which is procured from camphor; the second from gum or mucilage; and the third from cork, by the action of nitric acid.

METALLIC OXIDES.

The only metallic oxides found in plants are those of iron and manganesum: they are detected in the ashes of plants, but in very minute quantities only. When the ashes of plants are reddish brown, they abound in oxides of iron. When black or purple, in oxide of manganesum; when these colours are mixed they contain both substances.

ANALYSIS OF PEAS.

3840 parts of—	Parts.
Ripe peas afford, of starch	1265
Fibrous matter analogous to starch, with the coats of the peas	340
A substance analogous to gluten	550
Mucilage	249
Saccharine matter	81
Albumen	65
Volatile matter	540
Earthy phosphates	11
Loss	229

ANALYSIS OF OAK BARK.

1000 parts of dry oak bark, from a small tree deprived of epidermis, contain,—

Of woody fibre	876
— tannin	57
— extract	31
— mucilage	18
Of matter rendered insoluble during evaporation, probably a mixture of albumen and extract	9
— loss, partly saline matter	30

CHEMICAL LAWS.

M. M. Gay Lussac and Thenard have deduced three propositions, which they have called *laws*, from their experiments on vegetable substances. *The first* is, "that a vegetable substance is always acid whenever the oxygene it contains is to the hydrogene in a greater proportion than in water."

The second, "that a vegetable substance is always resinous, or oily, or spirituous, whenever it contains oxygene in a smaller proportion to the hydrogene than exists in water."

The third, "that a vegetable substance is neither acid nor resinous, but is either saccharine or mucilaginous, or analogous to woody fibre or starch, whenever the oxygene and hydrogene in it are in the same proportions as in water.

POTATOES.

In bulbous roots, and sometimes in common roots, a large quantity of starch, albumen, and mucilage, are often found deposited in the vessels; and they are most abundant after the sap has ceased to flow, and afford a nourishment for the early shoots made in spring. The potatoe is the bulb that contains the largest quantity of soluble matter in its cells and vessels; and it is of most importance in its application as food. Potatoes in general afford from $\frac{1}{5}$ to $\frac{1}{7}$ their weight of dry starch. From 100 parts of the common *Kidney potatoe*, Dr. Pearson obtained from 32 to 28 parts of meal, which contained from 23 to 20 of starch and mucilage: and 100 parts of the *Apple potatoe*, in various experiments, afforded me from 18 to 20 parts of pure starch. From five pounds of the variety of the potatoe called *Captain hart*, Mr. Skrimshire, jun. obtained 12 oz. of starch, from the same quantity of the *Rough red* potatoe $10\frac{1}{2}$ oz., from the *Moulton white* $11\frac{1}{4}$, from the *Yorkshire kidney* $10\frac{3}{4}$ oz., from *Hundred eyes* 9 oz., from *Purple red* $8\frac{1}{2}$, from *Ox noble* $8\frac{1}{4}$. The other soluble substances in the potatoe are albumen and mucilage.

From the analysis of Einhoff it appears that 7680 parts of potatoes afford—

Of starch	1153
— Fibrous matter analogous to starch	540
Carried forward	1693

Brought forward	1693
Of Albumen	107
— Mucilage in the state of saturated solution	312
	2112

So that a fourth part of the weight of the potatoe at least may be considered as nutritive matter.

TURNIPS, &C.

The turnip, carrot, and parsnip, afford principally saccharine, mucilaginous, and extractive matter. I obtained from 1000 parts of common turnips, 7 parts of mucilage, 34 of saccharine matter, and nearly 1 part of albumen. 1000 parts of carrots furnished 95 parts of sugar, 3 parts of mucilage, and ½ part of extract; 1000 parts of parsnip afforded 90 parts of saccharine matter, and 9 parts of mucilage. The *Walcheren*, or *white carrot*, gave, in 1000 parts, 98 parts of sugar, 2 parts of mucilage, and 1 of extract.

FRUITS.

Fruits, in the organization of their soft parts, approach to the nature of bulbs. They contain a certain quantity of nourishment laid up in their cells for the use of the embryon plant; mucilage, sugar, and starch, are found in many of them often combined with vegetable acids. Most of the fruit trees common in Britain have been naturalized on account of the saccharine matter they contain, which, united to the vegetable acids and mucilage, renders them at once agreeable to the taste and nutritive.

The value of fruits for the manufacture of fermented liquors may be judged of from the specific gravity of their expressed juices. The best cyder and perry are made from those apples and pears that afford the densest juices; and a comparison between different fruits may be made with tolerable accuracy by plunging them together into a saturated solution of salt, or a strong solution of sugar; those that sink deepest will afford the richest juice.

GRAIN.

Starch or coagulated mucilage forms the greatest part of the seeds and grains used for food, and they are generally combined with gluten, oil, or albuminous matter. In corn with gluten, in peas and beans with albuminous matter, and in rape-seed, hemp-seed, linseed, and the kernels of most nuts, with oils.

I found 100 parts of good full grained wheat sown in autumn to afford—

Of starch	77
— Gluten	19

100 parts of wheat sown in spring,

Of starch	70
— Gluten	24

100 parts of Barbary wheat,

Of starch	74
— Gluten	23

100 parts of Sicilian wheat,

Of starch	75
— Gluten	21

I have examined different specimens of North American wheat; all of them have contained rather more gluten than the British. In general the wheat of warm climates abounds more in gluten, and in insoluble parts; and it is of greater specific gravity, harder, and more difficult to grind.

The wheat of the South of Europe, in consequence of the larger quantity of gluten it contains, is peculiarly fitted for making macaroni, and other preparations of flower in which a glutinous quality is considered as an excellence.

In some experiments made on barley, I obtained from 100 parts of full and fair Norfolk barley,

Of Starch	79
— Gluten	6
— Husk	8

The remaining seven parts saccharine matter.

Einhoff has published a minute analysis of barley meal. He found in 3840 parts,

Of volatile matter	360
— Albumen	44
— Saccharine matter	200
— Mucilage	176
— Phosphate of lime, with some albumen	9
— Gluten	135
— Husk, with some gluten and starch	260
— Starch not quite free from gluten	2580
— Loss	78

Rye afforded to Einhoff, in 3840 parts, 2520 meal, 930 husk, and 390 moisture; and the same quantity of meal analysed gave,—

Of Starch	2345
— Albumen	126
— Mucilage	426
— Saccharine matter	126
— Gluten not dried	364

Remainder husk and loss.

I obtained from 1000 parts of rye, grown in Suffolk, 61 parts of starch, and 5 parts of gluten.

100 parts of oats, from Sussex, afforded me 59 parts of starch, 6 of gluten, and 2 of saccharine matter.

1000

1000 parts of peas, grown in Norfolk, afforded me 501 parts of starch, 22 parts of saccharine matter, 35 parts of albuminous matter, and 16 parts of extract, which became insoluble during evaporation of the saccharine fluid.

From 3840 parts of marsh beans (*Vicia faba*), Einhoff obtained,

Of Starch	1312
— Albumen	31
— other matters which may be conceived nutritive, such as gummy, starchy, fibrous matter analogous to animal matter	1204

The same quantity of kidney beans (*Phaseolus vulgaris*) afforded,

Of matter analogous to starch .	1805
— Albumen, and matter approaching to animal matter in its nature . .	851
— Mucilage . .	799

From 3840 parts of lentiles he obtained 1260 parts of starch, and 1433 of a matter analogous to animal matter.

The matter analogous to animal matter is described by Einhoff, as a glutinous substance insoluble in water, soluble in alcohol when dry, having the appearance of glue, probably a peculiar modification of gluten.

From 16 parts of hemp-seeds Bucholz obtained 3 parts of oil, 3½ parts of albumen, about 1¾ of saccharine and gummy matter. The insoluble husks and coats of the seeds weighed 6⅛ parts.

FLOWERS.

The different parts of flowers contain different substances: the pollen, or impregnating dust of the date, has been found by Fourcroy and Vauquelin to contain a matter analogous to gluten, and a soluble extract abounding in malic acid. Link found in the pollen of the hazle tree, much tannin and gluten.

Saccharine matter is found in the nectarium of flowers, or the receptacles within the corolla, and by tempting the larger insects into the flowers, it renders the work of impregnation more secure; for the pollen is often by their means applied to the stigma; and this is particularly the case when the male and female organs are in different flowers or different plants.

It has been stated, that the fragrance of flowers depends upon the volatile oils they contain, and these oils, by their constant evaporation, surround the flower with a kind of odorous atmosphere; which, at the same time that it entices larger insects, may probably preserve the parts of fructification from the ravages of smaller ones. Volatile oils, or odorous substances, seem particularly destructive to these minute insects and animalcules which feed on the substance of vegetables; thousands of aphides may be usually seen in the stalk and leaves of the rose, but none of them are ever observed on the flower. Camphor is used to preserve the collections of naturalists. The woods that contain aromatic oils are remarked for their indestructibility, and for their exemption from the attacks of insects: this is particularly the case with the cedar, rose-wood, and cypress. The gates of Constantinople, which were made of this last wood, stood entire from the time of Constantine, their founder, to that of Pope Eugene IV. a period of 1100 years.

The petals of many flowers afford saccharine and mucilaginous matter. The white lily yields mucilage abundantly; and the orange lily a mixture of mucilage and sugar; the petals of the convolvulus afford sugar, mucilage, and albuminous matter.

The chemical nature of the colouring matters of flowers has not as yet been subject to any very accurate observation. These colouring matters, in general, are very transient, particularly the blues and reds; alkalies change the colours of most flowers to green, and acids to red. An imitation of the colouring matter may be made by digesting solutions of gall-nuts with chalk; a green fluid is obtained, which becomes red by the action of an acid, and has its green colour restored by means of alkalies.

The yellow colouring matters of flowers are the most permanent; the carthamus contains a red and a yellow colouring matter, the yellow colouring matter is easily dissolved by water, and from the red rouge is prepared by a process which is kept secret.

NUTRITION.

The following table contains a statement of the quantity of soluble or nutritive matters contained in varieties of the different substances that have been mentioned, and of some others which are used as articles of food, either for man or cattle. The analyses are my own; and were conducted with a view to a knowledge of the general nature and quantity of the products, and not of their intimate chemical composition. The soluble matters afforded by the grasses, except that from the fiorin in winter, were obtained by Mr. Sinclair, gardener to the Duke of Bedford, from given

weights

weights of the grasses cut when the seeds were ripe; they were sent to me by his Grace's desire for chemical examination; and form part of the results of an important and extensive series of experiments on grasses, made by direction of the Duke, at Woburn Abbey, the full details of which I shall hereafter have the pleasure of stating.

Table of the Quantities of Soluble, or Nutritive, Matters, afforded by 1000 *Parts of different vegetable Substances.*

Vegetables.	*Whole quantity of soluble or nutritive matter.*	*Mucilage or Starch.*	*Saccharine matter or Sugar.*	*Gluten or Albumen.*	*Extract, or matter rendered insoluble during evaporation.*
Middlesex wheat .	955	765		190	
Spring wheat . .	940	700		240	
Mildewed wheat .	210	178		32	
Blighted wheat . .	650	520		130	
Sicilian wheat . .	956	725		230	
Sicilian wheat . .	961	722		239	
Wheat from Poland .	950	750		200	
North American wheat	955	730		225	
Norfolk barley . .	920	790	70	60	
Oats from Scotland .	743	641	15	87	
Rye from Yorkshire .	792	645	38	109	
Common bean . .	570	426		103	41
Dry peas	574	501	22	35	16
Potatoes	from 260 to 200	from 200 to 155	from 20 to 15	from 40 to 30	
Linseed cake . .	151	123	11	17	
Red beet	148	14	121	13	
White beet . . .	136	13	119	4	
Parsnip	99	9	90		
Carrots	98	3	95		
Common turnips . .	42	7	34	1	
Swedish turnips . .	64	9	51	2	2
Cabbage	73	41	24	8	
Broad-leaved clover .	39	31	3	2	3
Long-rooted clover .	39	30	4	3	2
White clover . . .	32	29	1	3	5
Sainfoin	39	28	2	3	6
Lucerne	23	18	1	—	4
Meadow fox-tail grass	33	24	3	—	6
Perennial rye . .	39	26	4	—	5
Fertile meadow . .	78	65	6	—	7
Roughish meadow .	39	29	5	—	6
Crested dog's-tail .	35	28	3	—	4
Spiked fescue . .	19	15	2	—	2
Sweet-scented soft .	82	72	4	—	6
Sweet-scented vernal	50	43	4	—	3
Fiorin	54	46	5	1	2
Fiorin cut in winter	76	64	8	1	3

All these substances were submitted to experiment green, and in their natural states. It is probable that the excellence of the different articles as food will be found to be in a great measure proportional to the quantities of soluble or nutritive matters they afford; but still these quantities cannot be regarded as absolutely denoting their value. Albuminous, or glutinous matters, have the characters of animal substances; sugar is more nourishing, and extractive matter less nourishing, than any other principles composed of carbon, hydrogene, and oxygene. Certain combinations likewise of these substances, may be more nutritive than others.

OF SOILS.

No subjects are of more importance to the farmer than the nature and improvement of soils; and no parts of the doctrines of agriculture are more capable of

of being illustrated by chemical enquiries.

The substances which constitute soils, are certain compounds of the earths, silica, lime, alumina, magnesia, and of the oxides of iron and manganesum; animal and vegetable matters in a decomposing state, and saline, acid or alkaline combinations.

To form a just idea of soils, it is necessary to conceive different rocks decomposed, or ground into parts and powder of different degrees of fineness; some of their soluble parts dissolved by water, and that water adhering to the mass, and the whole mixed with larger or smaller quantities of the remains of vegetables and animals, in different stages of decay.

In all chemical experiments on the composition of soils connected with agriculture, the constituent parts obtained are compounds; and they act as compounds in nature: it is in this state, therefore, that I shall describe their characteristic properties.

1. *Silica*, or the earth of *flints*, in its pure and crystallized form, is the substance known by the name of rock crystal, or Cornish diamond. As it is procured by chemists, it appears in the form of a white impalpable powder. It is not soluble in the common acids, but dissolves by heat in fixed alkaline lixivia. It is an incombustible substance, for it is saturated with oxygene. I have proved it to be a compound of oxygene, and the peculiar combustible body which I have named silicum; and from the experiments of Berzelius, it is probable that it contains nearly equal weights of these two elements.

2. The sensible properties of lime are well known. It exists in soils usually united to carbonic acid; which is easily disengaged from it by the attraction of the common acids. It is sometimes found combined with the phosphoric and sulphuric acids. Its chemical properties and agencies in its pure state will be described in the Lecture on manures obtained from the mineral kingdom. It is soluble in nitric and muriatic acids, and forms a substance with sulphuric acid, difficult of solution, called gypsum. It is not soluble in alkaline solutions. It consists of one proportion 40 of the peculiar metallic substance, which I have named calcium; and one proportion 15 of oxygene.

3. *Alumina* exists in a pure and crystallized state in the white sapphire, and united to a little oxide of iron and silica in the other oriental gems. In the state in which it is procured by chemists, it appears as a white powder, soluble in acids and fixed alkaline liquors. From my experiments, it appears that alumina consists of one proportion 33 of aluminum, and one 15 of oxygene.

4. *Magnesia* exists in a pure crystallized state, constituting a mineral like talc found in North America. In its common form, it is the *magnesia usta*, or calcined magnesia of druggists. It generally exists in soils combined with carbonic acid. It is soluble in all the mineral acids; but not in alkaline lixivia. It is distinguished from the other earths found in soils by its ready solubility in solutions of alkaline carbonates, saturated with carbonic acid. It appears to consist of 38 magnesium and 15 oxygene.

5. There are two well known *oxides of iron*, the black and the brown. The black is the substance that flies off when red hot iron is hammered. The brown oxide may be formed by keeping the black oxide red hot, for a long time in contact with air. The first seems to consist of one proportion of iron 103, and two of oxygene 30; and the second of one proportion of iron 103, and three proportions of oxygene 45. The oxides of iron sometimes exist in soils combined with carbonic acid. They are easily distinguished from other substances by their giving, when dissolved in acids, a black colour to solution of galls, and a bright blue precipitate to solution of prussiate of potassa and iron.

6. *The oxide of manganesum* is the substance commonly called manganese, and used in bleaching. It appears to be composed of one proportion of manganesum 113, and three of oxygene 45. It is distinguished from the other substances found in soils, by its property of decomposing muriatic acid, and converting it into chlorine.

Vegetable and animal matters are known by their sensible qualities, and by the property of being decomposed by heat. Their characters may be learnt from the details in the last Lecture.

8. The *saline compounds* found in soils, are common salt, sulphate of magnesia, sometimes sulphate of iron, nitrates of lime and of magnesia, sulphate of potassa, and carbonates of potassa and soda. To describe their characters minutely will be unnecessary.

The silica in soils is usually combined with

with alumina and oxide of iron, or with alumina lime magnesia and oxide of iron, forming gravel and sand of different degrees of fineness. The carbonate of lime is usually in an impalpable form; but sometimes in the state of calcareous sand. The magnesia, if not combined in the gravel and sand of soil, is in a fine powder united to carbonic acid. The impalpable part of the soil, which is usually called clay or loam, consists of silica, alumina, lime, and magnesia; and is, in fact, usually of the same composition as the hard sand, but more finely divided. The vegetable, or animal matters, (and the first is by far the most common in soils) exist in different states of decomposition. They are sometimes fibrous, sometimes entirely broken down and mixed with the soil.

ANALYSIS OF SOILS.

The instruments required for the analysis of soils are few, and but little expensive. They are a balance capable of containing a quarter of a pound of common soil, and capable of turning when loaded, with a grain; a set of weights from a quarter of a pound troy to a grain; a wire sieve, sufficiently coarse to admit a mustard seed through its apertures; an Argand lamp and stand; some glass bottles; Hessian crucibles; porcelain, or queen's ware evaporating basons; a Wedgewood pestle and mortar; some filtres made of half a sheet of blotting paper, folded so as to contain a pint of liquid, and greased at the edges; a bone knife, and an apparatus for collecting and measuring aeriform fluids.

The chemical substances, or reagents, required for separating the constituent parts of the soil, have, for the most part, been mentioned before: they are muriatic acid *(spirit of salt)*, sulphuric acid, pure volatile alkali dissolved in water, solution of prussiate of potash and iron, succinate of ammonia, soap lye, or solution of potassa, solutions of carbonate of ammonia, of muriate of ammonia, of neutral carbonate of potash, and nitrate of ammoniac.

Soils when collected, if they cannot be immediately examined, should be preserved in phials quite filled with them, and closed with ground glass stoppers.

The quantity of soil most convenient for a perfect analysis, is from two to four hundred grains. It should be collected in dry weather, and exposed to the atmosphere till it becomes dry to the touch.

A good turnip soil from Holkham, Norfolk, afforded me 8 parts out of 9 siliceous sand; and the finely divided matter consisted

Of carbonate of lime	-	63
— silica	- - -	15
— alumina	- -	11
— oxide of iron	- -	3
— vegetable and saline matter		5
— moisture	- - -	3

I found the soil taken from a field at Sheffield-place, in Sussex, remarkable for producing flourishing oaks, to consist of six parts of sand, and one part of clay and finely divided matter. And one hundred parts of the entire soil submitted to analysis, produced

		Parts.
Silica	- -	54
Alumina	- -	28
Carbonate of lime	-	3
Oxide of iron	- -	5
Decomposing vegetable matter		4
Moisture and loss		3

An excellent wheat soil from the neighbourhood of West Drayton, Middlesex, gave 3 parts in 5 of siliceous sand; and the finely divided matter consisted of

Carbonate of lime	-	28
Silica	- -	32
Alumina	- -	29
Animal or vegetable matter and moisture	- -	11

The soil of Bagshot heath, which is entirely devoid of vegetable covering, contains less than $\frac{1}{20}$ of finely divided matter. 400 parts of it, which had been heated red, afforded me 380 parts of coarse siliceous sand; 9 parts of fine siliceous sand, and 11 parts of impalpable matter, which was a mixture of ferruginous clay, with carbonate of lime. Vegetable or animal matters, when finely divided, not only give coherence, but likewise softness and penetrability; but neither they, nor any other part of the soil, must be in too great proportion; and a soil is unproductive, if it consist entirely of impalpable matters.

Pure alumina, or silica, pure carbonate of lime, or carbonate of magnesia, are incapable of supporting healthy vegetation.

No soil is fertile that contains as much as 19 parts out of 20 of any of the constituents that have been mentioned.

CONVERSION OF SOIL.

It will be asked, are the pure earths in the soil merely active as mechanical or indirect chemical agents, or do they actually afford food to the plant? This is an important question; and not difficult of solution.

The

The earths consist, as I have before stated, of metals united to oxygene; and these metals have not been decomposed: there is consequently no reason to suppose that the earths are convertible into the elements of organized compounds, into carbon, hydrogene, and azote.

Plants have been made to grow in given quantities of earth. They consume very small portions only; and what is lost may be accounted for by the quantities found in their ashes; that is to say, it has not been converted into any new products.

The carbonic acid united to lime or magnesia, if any stronger acid happens to be formed in the soil during the fermentation of vegetable matter which will disengage it from the earths, may be decomposed; but the earths themselves cannot be supposed convertible into other substances, by any process taking place in the soil.

In all cases the ashes of plants contain some of the earths of the soil in which they grow; but these earths never equal more than one-fiftieth of the weight of the plant consumed.

HOT AND COLD SOILS.

Many soils are popularly distinguished as *cold;* and the distinction, though at first view it may appear to be founded on prejudice, is really just. Some soils are much more heated by the rays of the sun, all other circumstances being equal, than others; and soils brought to the same degree of heat cool in different times, *i. e.* some cool much faster than others.

This property has been very little attended to in a philosophical point of view; yet it is of the highest importance in agriculture. In general, soils that consist principally of a stiff white clay are difficultly heated; and being usually very moist, they retain their heat only for a short time. *Chalks* are similar in one respect, that they are difficultly heated; but being drier they retain their heat longer, less being consumed in causing the evaporation of their moisture.

A black soil, containing much soft vegetable matter, is most heated by the sun and air; and the coloured soils, and the soils containing much carbonaceous matter, or ferruginous matter, exposed under equal circumstances to sun, acquire a much higher temperature than pale-coloured soils.

When soils are perfectly dry, those that most readily become heated by the solar rays, likewise cool most rapidly; but I have ascertained by experiment, that the darkest coloured dry soil (that which contains abundance of animal or vegetable matter, substances which most facilitate the diminution of temperature), when heated to the same degree, provided it be within the common limits of the effect of solar heat, will cool more slowly than a wet pale soil, entirely composed of earthy matter.

I found that a rich black mould, which contained nearly one-fourth of vegetable matter, had its temperature increased in an hour from 65° to 88° by exposure to sunshine; whilst a chalk soil was heated only to 69° under the same circumstances. But the mould removed into the shade, where the temperature was 62°, lost, in half an hour, 15°; whereas the chalk, under the same circumstances, had lost only 4°.

A brown fertile soil, and a cold barren clay were each artificially heated to 88°, having been previously dried: they were then exposed in a temperature of 57°; in half an hour the dark soil was found to have lost 9° of heat; the clay had lost only 6°. An equal portion of the clay containing moisture, after being heated to 88°, was exposed in a temperature of 55°; in less than a quarter of an hour it was found to have gained the temperature of the room. The soils in all these experiments were placed in small tin plate trays two inches square, and half an inch in depth; and the temperature ascertained by a delicate thermometer.

ABSORBING POWER.

The power of the soil to absorb water by cohesive attraction, depends in great measure upon the state of division of its parts; the more divided they are, the greater is their absorbent power. The different constituent parts of soils likewise appear to act, even by cohesive attraction, with different degrees of energy. Thus vegetable substances seem to be more absorbent than animal substances; animal substances more so than compounds of alumina and silica; and compounds of alumina and silica more absorbent than carbonates of lime and magnesia: these differences may, however, possibly depend upon the differences in their state of division, and upon the surface exposed.

The power of soils to absorb water from air, is much connected with fertility. When

When this power is great, the plant is supplied with moisture in dry seasons; and the effect of evaporation in the day is counteracted by the absorption of aqueous vapour from the atmosphere, by the interior parts of the soil during the day, and by both the exterior and interior during night.

The stiff clays, approaching to pipeclays in their nature, which take up the greatest quantity of water when it is poured upon them in a fluid form, are not the soils which absorb most moisture from the atmosphere in dry weather. They cake, and present only a small surface to the air; and the vegetation on them is generally burnt up almost as readily as on sands.

The soils that are most efficient in supplying the plant with water by atmospheric absorption, are those in which there is a due mixture of sand, finely divided clay, and carbonate of lime, with some animal or vegetable matter; and which are so loose and light, as to be freely permeable to the atmosphere. With respect to this quality, carbonate of lime and animal and vegetable matter are of great use in soils; they give absorbent power to the soil, without giving it likewise tenacity: sand, which also destroys tenacity, on the contrary, gives little absorbent power.

I have compared the absorbent powers of many soils with respect to atmospheric moisture, and I have always found it greatest in the most fertile soils; so that it affords one method of judging of the productiveness of land.

One thousand parts of a celebrated soil from Ormiston, in East Lothian, which contained more than half its weight of finely divided matter, of which 11 parts were carbonate of lime, and 9 parts vegetable matter, when dried at 212°, gained in an hour by exposure to air saturated with moisture, at temperature 62°, 18 grains.

One thousand parts of a very fertile soil from the banks of the river Parret, in Somersetshire, under the same circumstances, gained 16 grains.

One thousand parts of a soil from Mersea, in Essex, worth 45 shillings an acre, gained 13 grains.

1000 grains of a fine sand from Essex, worth 28 shillings an acre, gained 11 grains.

1000 of a coarse sand, worth 15 shillings an acre, gained only 8 grains.

1000 of the soil of Bagshot-heath gained only 3 grains.

Water, and the decomposing animal and vegetable matter existing in the soil, constitute the true nourishment of plants; and as the earthy parts of the soil are useful in retaining water, so as to supply it in the proper proportions to the roots of the vegetables, so they are likewise efficacious in producing the proper distribution of the animal or vegetable matter; when equally mixed with it they prevent it from decomposing too rapidly; and by their means the soluble parts are supplied in proper proportions.

ORIGIN OF SOILS.

Soils appear to have been originally produced in consequence of the decomposition of rocks and strata. It often happens that soils are found in an unaltered state upon the rocks from which they were derived. It is easy to form an idea of the manner in which rocks are converted into soils, by referring to the instance of soft granite, or porcelain granite. This substance consists of three ingredients, quartz, feldspar, and mica. The quartz is almost pure siliceous earth, in a crystalline form. The feldspar and mica are very compounded substances; both contain silica, alumina, and oxide of iron; in the feldspar there is usually lime and potassa; in the mica, lime and magnesia.

When a granitic rock of this kind has been long exposed to the influence of air and water, the lime and the potassa contained in its constituent parts are acted upon by water or carbonic acid; and the oxide of iron, which is almost always in its least oxided state, tends to combine with more oxygene; the consequence is, that the feldspar decomposes, and likewise the mica, but the first the most rapidly. The feldspar, which is, as it were, the cement of the stone, forms a fine clay: the mica, partially decomposed, mixes with it as sand; and the undecomposed quartz appears as gravel, or sand of different degrees of fineness.

As soon as the smallest layer of earth is formed on the surface of a rock, the seeds of lichens, mosses, and other imperfect vegetables which are constantly floating in the atmosphere, and which have made it their resting place, begin to vegetate; their death, decomposition, and decay, afford a certain quantity of organizable matter, which mixes with the earthy materials of the rock; in this improved soil more perfect plants are capable of subsisting; these in their turn absorb nourishment from water and the atmosphere; and after perishing afford new

new materials to those already provided: the decomposition of the rock still continues; and at length, by such slow and gradual processes, a soil is formed in which even forest trees can fix their roots, and which is fitted to reward the labours of the cultivator.

Poor and hungry soils, such as are produced from the decomposition of granitic and sandstone rocks, remain very often for ages with only a thin covering of vegetation. Soils from the decomposition of limestone, chalks, and basalts, are often clothed by nature with the perennial grasses; and afford, when ploughed up, a rich bed of vegetation for every species of cultivated plant.

GEOLOGY OF BRITISH ISLANDS.

It may not be improper to give a general description of the geological constitution of Great Britain and Ireland.—Granite forms the great ridge of hills extending from Land's End through Dartmoor into Devonshire. The highest rocky strata in Somersetshire are grauwacke and limestone. The Malvern hills are composed of granite, sienite, and porphyry. The highest mountains in Wales are chlorite schist, or grauwacke. Granite occurs at Mount Sorrel in Leicestershire. The great range of the mountains in Cumberland and Westmoreland, are porphyry, chlorite, schist, and grauwacke; but granite is found at their western boundary. Throughout Scotland the most elevated rocks are granite, sienite, and micaceous schistus.

No true secondary formations are found in South Britain, west of Dartmoor; and no basalt south of the Severn. The chalk district extends from the western part of Dorsetshire, to the eastern coast of Norfolk. The coal formations abound in the district between Glamorganshire and Derbyshire; and likewise in the secondary strata of Yorkshire, Durham, Westmoreland, and Northumberland. Serpentine is found only in three places in Great Britain; near Cape Lizard in Cornwall, Portsoy in Aberdeenshire, and in Ayrshire. Black and grey granular marble is found near Padstow in Cornwall; and other coloured primary marbles exist in the neighbourhood of Plymouth. Coloured primary marbles are abundant in Scotland; and white granular marble is found in the Isle of Sky, in Assynt, and on the banks of Loch Shin in Sutherland. The principal coal formations in Scotland are in Dumbartonshire, Ayrshire, Fifeshire, and on the banks of the Brora in Sutherland. Secondary limestone and sandstone are found in most of the low countries north of the Mendip hills.

In Ireland there are five great associations of primary mountains; the mountains of Morne in the county of Down; the mountains of Donegal; those of Mayo and Galway, those of Wicklow, and those of Kerry. The rocks composing the four first of these mountain chains are principally granite, gneis, sienite, micaceous schist, and porphyry. The mountains of Kerry are chiefly constituted by granular quartz, and chlorite schist. Coloured marble is found near Killarney; and white marble on the western coast of Donegal.

Limestone and sandstone are the common secondary rocks found south of Dublin. In Sligo, Roscommon, and Leitrim, limestone, sandstone, shale, iron-stone, and bituminous coal, are found. The secondary hills in these counties are of considerable elevation; and many of them have basaltic summits. The northern coast of Ireland is principally basalt; this rock commonly reposes upon a white limestone, containing layers of flint, and the same fossils as chalk; but it is considerably harder than that rock. There are some instances, in this district, in which columnar basalt is found above sandstone and shale, alternating with coal. The stone coal of Ireland is principally found in Kilkenny, associated with limestone and grauwacke.

ALLUVIAL SOILS.

In general, the soils, the materials of which are the most various and heterogeneous, are those called alluvial, or which have been formed from the depositions of rivers; many of them are extremely fertile. I have examined some productive alluvial soils, which have been very different in their composition. The soil from the banks of the river Parret in Somersetshire, afforded me eight parts of finely divided earthy matter, and one part of siliceous sand; and an analysis of the finely divided matter gave the following results.

360 parts of carbonate of lime.
25 ——— alumina.
20 ——— silica.
8 ——— oxide of iron.
19 ——— vegetable, animal, and saline matter.

A rich soil from the neighbourhood of the Avon, in the valley of Evesham in Worcestershire, afforded me three-fifths of fine sand, and two-fifths of impalpable

ble matter; the impalpable matter consisted of,

35 alumina.
41 silica.
14 carbonate of lime.
3 oxide of iron.
7 vegetable, animal, and saline matter.

A specimen of good soil from Tiviotdale afforded five-sixths of fine siliceous sand, and one-sixth of impalpable matter; which consisted of

41 alumina.
42 silica.
4 carbonate of lime.
5 oxide of iron.
8 vegetable, animal, and saline matter.

A soil yielding excellent pasture from the valley of the Avon, near Salisbury, afforded one-eleventh of coarse siliceous sand; and the finely divided matter consisted of

7 alumina.
14 silica.
63 carbonate of lime.
2 oxide of iron.
14 vegetable, animal, and saline matter.

In all these instances the fertility seems to depend upon the state of division, and mixture of the earthy materials and the vegetable and animal matter.

IMPROVEMENTS.

In ascertaining the composition of sterile soils with a view to their improvement, any particular ingredient which is the cause of their unproductiveness, should be particularly attended to; if possible, they should be compared with fertile soils in the same neighbourhood, and in similar situations, as the difference of the composition may, in many cases, indicate the most proper methods of improvement. If on washing a sterile soil it is found to contain the salts of iron, or any acid matter, it may be ameliorated by the application of quick-lime. A soil of good apparent texture, from Lincolnshire, was put into my hands by Sir Joseph Banks, as remarkable for sterility: on examining it, I found that it contained sulphate of iron; and I offered the obvious remedy of top-dressing with lime, which converts the sulphate into a manure. If there be an excess of calcareous matter in the soil, it may be improved by the application of sand or clay. Soils too abundant in sand are benefited by the use of clay, or marle, or vegetable matter. A field belonging to Sir Robert Vaughan at Nannau, Merionethshire, the soil of which was a light sand, was much burnt up in the summer of 1805; I recommended to that gentleman the application of peat as a top dressing. The experiment was attended with immediate good effects; and Sir Robert last year informed me, that the benefit was permanent. A deficiency of vegetable or animal matter must be supplied by manure. An excess of vegetable matter is to be removed by burning, or to be remedied by the application of earthy materials. The improvement of peats, or bogs, or marsh lands, must be preceded by draining; stagnant water being injurious to all the nutritive classes of plants. Soft black peats, when drained, are often made productive by the mere application of sand or clay as a top dressing. When peats are acid, or contain ferruginous salts, calcareous matter is absolutely necessary in bringing them into cultivation. When they abound in the branches and roots of trees, or when their surface entirely consists of living vegetables, the wood or the vegetables must either be carried off, or be destroyed by burning. In the last case their ashes afford earthy ingredients, fitted to improve the texture of the peat.

The best natural soils are those of which the materials have been derived from different strata; which have been minutely divided by air and water, and are intimately blended together: and in improving soils artificially, the farmer cannot do better than imitate the processes of nature.

The materials necessary for the purpose are seldom far distant: coarse sand is often found immediately on chalk; and beds of sand and gravel are common below clay. The labour of improving the texture or constitution of the soil, is repaid by a great permanent advantage; less manure is required, and its fertility insured: and capital laid out in this way secures for ever the productiveness, and consequently the value, of the land.

PRINCIPLES OF MANURES.

Vegetable and animal substances, as is shown by universal experience, are consumed in vegetation; and they can only nourish the plant by affording solid matters capable of being dissolved by water, or gaseous substances capable of being absorbed by the fluids in the leaves of vegetables: but such parts of them as are rendered gaseous, and that pass into the atmosphere, must produce a comparatively

ratively small effect, for gases soon become diffused through the mass of the surrounding air. The great object in the application of manure should be to make it afford as much soluble matter as possible to the roots of the plant; and that in a slow and gradual manner, so that it may be entirely consumed in forming the sap or organized parts of the plant.

Mucilaginous, gelatinous, saccharine, oily, and extractive fluids, and solution of carbonic acid in water, are substances that in their unchanged states contain almost all the principles necessary for the life of plants; but there are few cases in which they can be applied as manures in their pure forms; and vegetable manures, in general, contain a great excess of fibrous and insoluble matter, which must undergo chemical changes before they can become the food of plants.

Whenever manures consist principally of matter soluble in water, it is evident that their fermentation or putrefaction should be prevented as much as possible; and the only cases in which these processes can be useful, are when the manure consists principally of vegetable or animal fibre. The circumstances necessary for the putrefaction of animal substances are similar to those required for the fermentation of vegetable substances; a temperature above the freezing point, the presence of water, and the presence of oxygene, at least in the first stage of the process.

To prevent manures from decomposing, they should be preserved dry, defended from the contact of air, and kept as cool as possible.

PARTICULAR MANURES.

As different manures contain different proportions of the elements necessary to vegetation, so they require a different treatment to enable them to produce their full effects in agriculture. I shall therefore describe in detail the properties and nature of the manures in common use, and give some general views respecting the best modes of preserving and applying them.

All *green succulent plants* contain saccharine or mucilaginous matter, with woody fibre, and readily ferment. They cannot, therefore, if intended for manure, be used too soon after their death.

When *green crops* are to be employed for enriching a soil, they should be ploughed in, if it be possible, when in flower, or at the time the flower is beginning to appear, for it is at this period that they contain the largest quantity of easily soluble matter, and that their leaves are most active in forming nutritive matter. Green crops, pond weeds, the paring of hedges or ditches, or any kind of fresh vegetable matter, requires no preparation to fit them for manure. The decomposition slowly proceeds beneath the soil; the soluble matters are gradually dissolved, and the slight fermentation that goes on, checked by the want of a free communication of air, tends to render the woody fibre soluble, without occasioning the rapid dissipation of elastic matter.

When old pastures are broken up and made arable, not only has the soil been enriched by the death and slow decay of the plants which have left soluble matters in the soil; but the leaves and roots of the grasses living at the time, and occupying so large a part of the surface, afford saccharine, mucilaginous, and extractive matters, which become immediately the food of the crop; and the gradual decomposition affords a supply for successive years.

Rape cake, which is used with great success as a manure, contains a large quantity of mucilage, some albuminous matter, and a small quantity of oil. This manure should be used recent, and kept as dry as possible before it is applied. It forms an excellent dressing for turnip crops; and is most œconomically applied by being thrown into the soil at the same time with the seed. Whoever wishes to see this practice in its highest degree of perfection, should attend Mr. Coke's annual sheep-shearing at Holkham.

Malt dust consists chiefly of the infant radicle separated from the grain. I have never made any experiment upon this manure; but there is great reason to suppose it must contain saccharine matter; and this will account for its powerful effects. Like rape cake it should be used as dry as possible, and its fermentation prevented.

Linseed cake is too valuable as a food for cattle, to be much employed as a manure; the analysis of linseed was referred to in the third Lecture. The water in which flax and hemp are steeped for the purpose of obtaining the pure vegetable fibre, has considerable fertilizing power. It appears to contain a substance analogous to albumen, and likewise much vegetable extractive matter. It putrefies very readily. A certain

tain degree of fermentation is absolutely necessary to obtain the flax and hemp in a proper state; the water to which they have been exposed, should therefore be used as a manure as soon as the vegetable fibre is removed from it.

Sea weeds, consisting of different species of fuci, algæ, and confervæ, are much used as a manure on the sea coasts of Britain and Ireland. By digesting the common fucus, which is the sea weed usually most abundant on the coast, in boiling water, I obtained from it one-eighth of a gelatinous substance, which had characters similar to mucilage. A quantity distilled gave nearly four-fifths of its weight of water, but no ammonia; the water had an empyreumatic and slightly sour taste; the ashes contained sea salt, carbonate of soda, and carbonaceous matter. The gaseous matter afforded was small in quantity, principally carbonic acid and gaseous oxide of carbon, with a little hydrocarbonate. This manure is transient in its effects, and does not last for more than a single crop, which is easily accounted for from the large quantity of water, or the elements of water it contains. It decays without producing heat when exposed to the atmosphere, and seems as it were to melt down and dissolve away. I have seen a large heap entirely destroyed in less than two years, nothing remaining but a little black fibrous matter.

Dry straw of wheat, oats, barley, beans and peas, and spoiled hay, or any other similar kind of dry vegetable matter, is, in all cases, useful manure. In general, such substances are made to ferment before they are employed, though it may be doubted whether the practice should be indiscriminately adopted. From 400 grains of dry barley straw I obtained eight grains of matter soluble in water, which had a brown colour, and tasted like mucilage. From 400 grains of wheaten straw I obtained five grains of a similar substance. There can be no doubt that the straw of different crops immediately ploughed into the ground, affords nourishment to plants; but there is an objection to this method of using straw from the difficulty of burying long straw, and from its rendering the husbandry foul. When straw is made to ferment, it becomes a more manageable manure; but there is likewise on the whole a great loss of nutritive matter. More manure is perhaps supplied for a single crop; but the land is less improved than it would be, supposing the whole of the vegetable matter could be finely divided and mixed with the soil. It is usual to carry straw that can be employed for no other purpose to the dunghill, to ferment, and decompose; but it is worth experiment, whether it may not be more œconomically applied when chopped small by a proper machine, and kept dry till it is ploughed in for the use of a crop. In this case, though it would decompose much more slowly, and produce less effect at first, yet its influence would be much more lasting.

Mere woody fibre seems to be the only vegetable matter that requires fermentation to render it nutritive to plants. Tanners *spent bark* is a substance of this kind.

Inert peaty matter is a substance of the same kind. It remains for years exposed to water and air, without undergoing change; and in this state yields little or no nourishment to plants.

Wood-ashes imperfectly formed, that is, wood-ashes containing much charcoal, are said to have been used with success as a manure. A part of their effects may be owing to the slow and gradual consumption of the charcoal, which seems capable, under other circumstances than those of actual combustion, of absorbing oxygene so as to become carbonic acid. Manures from animal substances, in general, require no chemical preparation to fit them for the soil. The great object of the farmer is to blend them with the earthy constituents in a proper state of division, and to prevent their too rapid decomposition. The entire parts of the muscles of land animals, are not commonly used as manure, though there are many cases in which such an application might be easily made. Horses, dogs, sheep, deer, and other quadrupeds that have died accidentally, or of disease, after their skins are separated, are often suffered to remain exposed to the air, or immersed in water till they are destroyed by birds or beasts of prey, or entirely decomposed; and in this case most of their organized matter is lost for the land in which they lie, and a considerable portion of it employed in giving off noxious gases to the atmosphere. By covering dead animals with five or six times their bulk of soil, mixed with one part of lime, and suffering them to remain for a few months; their decomposition would impregnate the soil with soluble matters, so as to render it an excellent manure; and by mixing a little fresh quicklime with it at the time of its removal,

removal, the disagreeable effluvia would be in a great measure destroyed; and it might be applied in the same way as any other manure to crops.

Fish forms a powerful manure in whatever state it is applied; but it cannot be ploughed in too fresh, though the quantity should be limited. Mr. Young records an experiment, in which herrings spread over a field and ploughed in for wheat, produced so rank a crop, that it was entirely laid before harvest. Amongst oily substances, graves and blubber are employed as manure. They are both most useful when mixed with soil, so as to expose a large surface to the air, the oxygene of which produces soluble matter from them. Lord Somerville used blubber with great success at his farm in Surrey. It was made into a heap with soil, and retained its powers of fertilizing for several successive years. The carbon and hydrogene abounding in oily substances, fully account for their effects; and their durability is easily explained from the gradual manner in which they change by the action of air and water.

Bones are much used as a manure in the neighbourhood of London. After being broken and boiled for grease, they are sold to the farmer. The more divided they are, the more powerful are their effects. The expense of grinding them in a mill, would probably be repaid by the increase of their fertilizing powers; and in the state of powder they might be used in the drill husbandry, and delivered with the seed in the same manner as rape cake. Bone dust, and bone shavings, the refuse of the turning manufacture, may be advantageously employed in the same way. The basis of bone is constituted by earthy salts, principally phosphate of lime, with some carbonate of lime and phosphate of magnesia; the easily decomposable substances in bone are fat, gelatine, and cartilage, which seems of the same nature as coagulated albumen.

Hair, woollen rags, and *feathers*, are all analogous in composition, and principally consist of a substance similar to albumen, united to gelatine. This is shown by the ingenious researches of Mr. Hatchett. The theory of their operation is similar to that of bone and horn shavings. The refuse of the different manufactures of skin and leather, form very useful manures; such as the shavings of the currier, furriers' clippings, and the offals of the tan-yard and of the glue-maker. The gelatine contained in every kind of skin, is in a state fitted for its gradual solution or decomposition; and when buried in the soil, it lasts for a considerable time, and constantly affords a supply of nutritive matter to the plants in its neighbourhood.

Blood contains certain quantities of all the principles found in other animal substances, and is consequently a very good manure. It has been already stated, that it contains fibrine; it likewise contains albumen: the red particles in it which have been supposed by many foreign chemists to be coloured by iron, in a particular state of combination with oxygene and acid matter, Mr. Brande considers as formed of a peculiar animal substance, containing very little iron. The scum taken from the boilers of the sugar bakers, and which is used as manure, principally consists of bullock's blood, which has been employed for the purpose of separating the impurities of common brown sugar, by means of the coagulation of its albuminous matter by the heat of the boiler. Amongst excrementitious animal substances used as manures, *urine* is the one upon which the greatest number of chemical experiments have been made, and the nature of which is best understood. The urine of the cow contains, according to the experiments of Mr. Brande,

Water	65
Phosphate of lime	3
Muriates of potassa and ammonia	15
Sulphate of potassa	6
Carbonates, and potassa, and ammonia	4
Urea	4

The urine of the horse, according to Fourcroy and Vauquelin, contains

Of carbonate of lime	11
— carbonate of soda	9
— benzoate of soda	24
— Muriate of potassa	9
— Urea	7
— Water and mucilage	940

In addition to these substances, Mr. Brande found in it phosphate of lime.

The urine of the ass, the camel, the rabbit, and domestic fowls, have been submitted to different experiments, and their constitutions have been found similar. In the urine of the rabbit, in addition to most of the ingredients above mentioned, Vauquelin detected gelatine; and the same chemist discovered uric acid in the urine of domestic fowls.

Human urine contains a greater variety of constituents than any other species examined.

Urea,

Urea, uric acid, and another acid similar to it in nature, called rosacic acid, acetic acid, albumen, gelatine, a resinous matter, and various salts are found in it.

Amongst excrementitious solid substances used as manures, one of the most powerful is the *dung* of *birds* that feed on *animal food*, particularly the dung of sea birds. The *guano*, which is used to a great extent in South America, and which is the manure that fertilizes the sterile plains of Peru, is a production of this kind. It exists abundantly, as we are informed by M. Humboldt, on the small islands in the South Sea, at Chinche, Ilo, Iza, and Arica. 50 vessels are laden with it annually at Chinche, each of which carries from 1500 to 2000 cubical feet. It is used as a manure only in very small quantities, and particularly for crops of maize.

The dung of sea birds has, I believe, never been used as a manure in this country; but it is probable that even the soil of the small islands on our coast, much frequented by them, would fertilize. Some dung of sea birds, brought from a rock on the coast of Merionethshire, produced a powerful, but transient, effect on grass. It was tried, at my request, by Sir Robert Vaughan at Nannau.

Night soil, it is well known, is a very powerful manure, and very liable to decompose. It differs in its composition, but always abounds in substances composed of carbon, hydrogene, azote, and oxygene. From the analysis of Berzelius, it appears that a part of it is always soluble in water; and in whatever state it is used, whether recent or fermented, it supplies abundance of food to plants.

After night soil, *pigeons' dung* comes next in order, as to fertilizing power. I digested 100 grains of pigeons' dung in hot water for some hours, and obtained from it 23 grains of soluble matter; which afforded abundance of carbonate of ammonia by distillation; and left carbonaceous matter, saline matter, principally common salt, and carbonate of lime, as a residuum. Pigeons' dung, when moist, readily ferments, and after fermentation contains less soluble matter than before: from 100 parts of fermented pigeons' dung I obtained only eight parts of soluble matter, which gave proportionally less carbonate of ammonia in distillation than recent pigeons' dung.

The dung of *domestic fowls* approaches very nearly in its nature to pigeons' dung. Uric acid has been found in it. It gives carbonate of ammonia by distillation, and immediately yields soluble matter to water. It is very liable to ferment.

The *dung* of *cattle*, *oxen* and *cows*, has been chemically examined by M. M. Einhof and Thaer. They found that it contained matter soluble in water; and that it gave in fermentation nearly the same products as vegetable substances, absorbing oxygene, and producing carbonic acid gas.

The recent *dung* of *sheep*, and of *deer*, afford, when long boiled in water, soluble matters, which equal from two to three per cent. of their weight. I have examined these soluble substances, procured by solution and evaporation; they contain a very small quantity of matter analogous to animal mucus, and are principally composed of a bitter extract, soluble both in water and in alcohol. They give ammoniacal fumes by distillation, and appear to differ very little in composition.

I watered some blades of grass for several successive days with a solution of these extracts; they evidently became greener in consequence, and grew more vigorously than grass in other respects, under the same circumstances.

The part of the dung of cattle, sheep, and deer, not soluble in water, appears to be mere woody fibre, and precisely analogous to the residuum of those vegetables that form their food after they have been deprived of all their soluble materials.

The dung of horses gives a brown fluid, which when evaporated yields a bitter extract, which affords ammoniacal fumes more copiously than that from the dung of oxen. If the pure dung of cattle is to be used as manure, like the other species of dung which have been mentioned, there seems no reason why it should be made to ferment, except in the soil; or, if suffered to ferment, it should be only in a very slight degree. The grass in the neighbourhood of recently voided dung is always coarse and dark green; some persons have attributed this to a noxious quality in unfermented dung, but it seems to be rather the result of an excess of food furnished to the plants.

The question of the proper mode of the application of the dung of horses and cattle, however, properly belongs to the subject of *composite manures*, for it is usually mixed in the farm-yard with straw, offal, chaff, and various kind of litter; and itself contains a large proportion of fibrous vegetable matter. A slight incipient fermentation is undoubtedly of use

in the dunghill, for by means of it a disposition is brought on in the woody fibre to decay and dissolve, when it is carried to the land, or ploughed into the soil; and woody fibre is always in great excess in the refuse of the farm. Too great a degree of fermentation is, however, very prejudicial to the composite manure in the dunghill; it is better that there should be no fermentation at all before the manure is used, than that it should be carried too far. This must be obvious from what has been already stated. The excess of fermentation tends to the destruction and dissipation of the most useful part of the manure; and the ultimate results of this process are like those of combustion.

A great objection against slightly fermented dung is, that weeds spring up more luxuriantly where it is applied. If there are seeds carried out in the dung they certainly will germinate, but it is seldom that this can be the case to any extent; and if the land is not cleansed of weeds, any kind of manure, fermented or unfermented, will occasion their rapid growth. If slightly fermented farm-yard dung is used as a top dressing for pastures, the long straws and unfermented vegetable matter remaining on the surface should be removed, as soon as the grass begins to rise vigorously, by raking, and carried back to the dunghill; in this case no manure will be lost, and the husbandry will be at once clean and œconomical.

In cases when farm-yard dung cannot be immediately applied to crops, the destructive fermentation of it should be prevented as much as possible; the principles on which this may be effected have been already alluded to. The surface should be defended as much as possible from the oxygene of the atmosphere; a compact marle, or a tenacious clay, offers the best protection against the air; and before the dung is covered over, or, as it were, sealed up, it should be dried as much as possible. If the dung is found at any time to heat strongly, it should be turned over, and cooled by exposure to air. When dung is to be preserved for any time, the situation in which it is kept is of importance. It should, if possible, be defended from the sun. To preserve it under sheds would be of great use; or to make the site of a dunghill on the north side of a wall. The floor on which the dung is heaped, should, if possible, be paved with flat stones; and there should be a little inclination from each side towards the centre, in which there should be drains connected with a small well furnished with a pump, by which any fluid matter may be collected for the use of the land. It too often happens that a dense mucilaginous and extractive fluid is suffered to drain away from the dunghill, so as to be entirely lost to the farm.

Street and *road dung*, and the *sweepings of houses*, may be all regarded as composite manures; the constitution of them is necessarily various, as they are derived from a number of different substances. These manures are usually applied in a proper manner, without being fermented.

Soot, which is principally formed from the combustion of pit-coal or coal, generally contains likewise substances derived from animal matters. This is a very powerful manure. It affords ammoniacal salts by distillation, and yields a brown extract to hot water, of a bitter taste. It likewise contains an empyreumatic oil. Its great basis is charcoal, in a state in which it is capable of being rendered soluble by the action of oxygene and water.

THE
ELEMENTS
OF THE
SCIENCE OF MONEY,
FOUNDED ON PRINCIPLES OF THE
LAW OF NATURE.
BY
JOHN PRINCE SMITH, Esq.
Of Gray's Inn, Barrister at Law.
8vo. 15s.

[This is by far the most perspicuous view we have seen of the most important subject which at present can engage the attention of British patriotism. Notwithstanding the wanton assertions of our *experimental war faction*, England is really in NO DANGER WHATEVER, except from the bad passions, folly and improvidence of enemies within her own bowels. Already have those insatiable foes unprofitably devoured more than the fee-simple of all the lands and houses in the empire, taken at an average of their nominal worth, between the revolution and the present period; yet nothing will satisfy them, even though they now draw from the country above one hundred and twenty millions per annum, or above fifteen times as much as served them in the glorious years of 1759 and 1760. They cry out for WAR, for ETERNAL and UNIVERSAL WAR—and we fear they will have their way, as long as the accursed funding

funding system can be made to supply their wants. Hitherto, such demoniacal passions have been checked by want of means; but of late, alas, they have reigned uncontrolled, and seem likely to maintain their horrible ascendancy, till they have exhausted all their resources, or if these are indefinite, till the two last survivors of the human race have destroyed each other! On the subject of money and finance, this volume of Mr. PRINCE SMITH is a complete system, and is an improvement in that department of the science of Adam Smith, in the degree in which new facts and reiterated discussions have introduced us to a better acquaintance with the subject.]

NATIONAL POWER.

THREE powers may be said to rule the world: money, arts, and arms; or wealth, knowledge, and force.

It ought not, therefore, to excite surprise that the circumstances of the present time have occasioned extensive inquiry and various opinion. A nation, populous, mighty in arms, rich in commerce, profound in science, skilful in arts, is arrived at a new era in political economy. Burthened with debt and taxation, it is absolutely without money. Its debts are estimated at more than eight hundred millions, the average revenue is 63,763,746; the annual loans are 12,673,548, and the total expenditure 82,205,066, taking the estimate of the year 1811; while the income tax, upon the private revenue of all persons having 60l. a year, amounts to 11,000,000l. and the total of such revenue to about 110,000,000l. Yet is all this revenue and expenditure managed with much facility. The different amounts are settled by the exchange of certain pieces of paper, with a quantity of dollar-tokens and bad shillings, from which every stamp of authority is effaced.

CREDIT.

Credit, said the apostle of revolution, the celebrated *Paine*, is suspicion asleep. Paper credit, he might now say, is maintained at its highest point by the awakening of terror. Never was the alarm against paper more violent, never was its circulation more extensive or more increasing. It is fear only which now gives a currency to paper so universal that, at its lowest estimate, it will be impossible to convert it into coin at its true standard, and, therefore, impossible to pay it, in any legitimate sense. It is fear alone which will sustain it, till the hour when its evils shall so outweigh its benefits, that the whole nation will cry aloud for its destruction.

How near or how distant may be that period, it is not for any one to pronounce; but it seems a reasonable opinion, that there are certain elements in the composition of public credit, which must finally lead to its overthrow. And that nations, having for above a century involved themselves in debt, will, like individuals, find the burthen insupportable, and endeavour to shake it off.

Hume pronounced, that either the nation must destroy public credit, or public credit must destroy the nation. By nation, he understands, of course, the state; since the only means of destroying a people are by the mortality of war and desolation, by plague, pestilence, and famine: and we have seen one nation of Europe rise like Antæus, as a giant refreshed, from having fallen with the ruin of her finances.

We have seen France stripped of all her gold, unsheath the sword of conquest, bring wealth in abundance to her treasury, by the plunder of surrounding states, and maintain a circulation of coin, unparalleled in purity and extent by any of her neighbours. Whether a similar fate is reserved for England, no one can venture to surmise. But there are many amongst us, who look to a national bankruptcy as to a state of regeneration: as the era from which to date a new career of glory and of grandeur to the British name and the British constitution.

SINKING FUND.

By others, however, it is thought that the discovery of the sinking fund is like a new power in mechanics, and will enable the state to roll on, with the everlasting course of the planetary system, through a splendid zodiac of debt and taxation, revenue and expenditure, bank notes and exchequer bills, annual loans and quarterly accumulations of interest, repurchases of old debts, and immediate integrations of new ones. To such visionaries, the bank and the tax office appear the sources of political light and vitality, as necessary to the preservation of liberty and commerce, as the sun and moon to the ruling of the day and night.

THE AUTHOR'S OPINION.

A friend to truth and to his country may, however, be permitted to stand between these antagonists in opinion, and holding that debt cannot be perpetual, pronounce, that, while he fears the sinking fund will be discovered, in the end,

to have more of deception in it than is generally supposed, yet there are terrors in a national bankruptcy, which may well give us pause before we declare an act of insolvency to deliver the state from its present enthralment.

An impartial observer may speak his opinions, or rather confess his fears explicitly. Of the two parties in the House of Commons, one has pronounced, that the state is in danger from the extension of paper credit: that it is absolutely necessary to restore coin into circulation, and for this purpose, to compel the bank of England to pay all its notes within two years. While the opposite side agree in the necessity of restoring the currency of coin, but declare that the time is not arrived at which it can be effected. The latter enumerate the various *items* of taxation, revenue and expenditure, and the amount of bank-notes, omitting to notice those of country bankers; and declare, that it is quite impossible to support the circulation requisite for these purposes with a smaller number of notes. They propose, therefore, to delay the time of payment till the arrival of peace; when the bank of England will, by the present statute law of the realm, be compelled to pay all its notes on demand, after six months from the signing of a definitive treaty.

POLITICAL PROSPECTS.

"The necessity of the times," is a phrase of constant occurrence, but it has never yet been explained. Necessity is sometimes a salutary principle, and adversity in her milder form is a moral teacher of unrivalled power, who is at once the touchstone of wit, and the spur of industry. Not so, however, when necessity, as in the present period, assumes the form of want, and frowns despair on every labour: not so when every man, haunted by the evil genius of *Sisyphus*, moves forward, with unceasing struggles, the wheel of his adverse fortune; and at every expected station of his hope, beholds it roll back with perverse malignity. Not so, when exhausted labour, instead of tranquillity, finds nothing but keen anxious penury in retirement; and when the cares of a parent to place a child in the moderate independence of a permanent estate, prove at last that incessant labour, or absolute want, must be the lot of all men.

In such times there can be no influence of the middle class, no prevailing sentiment of calm dignity and refined philosophy: all is contention, struggle, heat, anxiety, desperation, giddy vanity, idle dissipation, and gloomy want.

The state of society has undergone an alarming change; luxury increases amongst all classes; and it is unavoidable in a state of arts and manufactures rapidly progressive. Speculation proceeds with various success, notorious in the splendour of its rise, and forgotten in the obscurity of its fall. *Money daily decreases fast in value; the wants of every man increase, as his income grows more unequal to their supply: the poor are driven to despair, the rich are goaded by their necessities.* Political corruption and a train of innumerable vices rise in pestilential exhalations from the sordid mixture of pining want, overheated speculation, and loose extravagance. Whence, if not from these causes, arise the encreasing thirst of lucre, and that devotion to parliamentary influence, which has banished from the country the independence of the lesser gentry! Whence the restlessness of all classes in their actual situation, and the ceaseless desire of change! Whence the decrease of the moral influence of the virtuous, but poor and disregarded clergyman! Whence the cupidity of office! Whence the contempt of all virtuous indifference to the acquisition of money! Whence the repeated failures of so many collectors and distributors of the public revenue; who become peculators and defaulters amidst splendour, and with the countenance of the great; when all are obliged to confess, that while their emoluments seem adequate to every fair expence, all settled expence becomes ruinous, without a nominal revenue daily increasing!

The ordinary thirst for money, and its necessary depreciation, will in some degree account for these facts so fully acknowledged. But, add to the temptations of lucre the increasing pressure of the times, occasioned by the daily and rapid decrease of the value of money, a new power of manifold attraction is immediately given to this natural passion, and innumerable victims, who would else escape, are brought within the vortex of its most destructive influence.

Let the virtuous amongst our legislators reflect deeply on this single topic, and discover that these are the infallible effects of a debased currency, which converts apparent wealth into real poverty, and loudly will they demand a reform in this anomalous and unnatural system of money;

money: which may bring us back to settled rates of exchange, and settled habits of economy; and with the uniformity of the coin, and the equality of paper, restore to us the more uniform practice of virtue and moderation.

Amongst other topics of some novelty introduced into this work, are the estimated dangers of the sinking fund; and if this universal panacea of state insolvency, this nostrum of duplicate proportion, be not founded on an erroneous principle, in which the numerical powers of calculation are mistaken for the physical powers of money, let it remain. But if its real theory is of questionable efficacy, let it be examined, through the medium of the press, with adequate caution; let it be discussed with freedom and philosophy; and, if in the end necessity demands it, let it be destroyed.

But to innovate, or to destroy without examination, is odious and rash; and the minister that shall touch it before the press has prepared the nation for its removal, will risk the contempt of the liberal, and the detestation of a disappointed people.

By the press then, let the sinking fund and its operation be previously examined; and let not, as on some recent occasions, disguised and indirect censures be insinuated against the freedom of public inquiry into existing institutions, and the abuses of ill-delegated power; for it is a right, without which freedom has no security, virtue no honour, baseness no infamy, and truth and science no air or nutriment.

Happy is the author of this work to have been, in any the most humble degree, the advocate of the equal and mutual rights of religious toleration and a free press; and never may it escape the recollection of his fellow Britons, that the press is the safest oracle of public opinion, to inform, to controul, and to direct, even the faithful delegates of a people, truly represented by honest election, in the legislative assembly of the nation; while the free unbiassed opinion of an enlightened, liberal, uncorrupted, unbewildered, and undeluded people, is the true support of free government, the basis of legitimate authority, and the spring and source of all that is pure and illustrious in the dignity of rightful thrones.

THE LAW OF NATURE.

Law is, essentially, a rule of conduct, whether imposed by reason or by civil authority.

The laws of peculiar states are rules of conduct imposed by the state.

The law of nature is that rule of conduct which is most convenient for man generally; and which arises out of a due consideration of his duties and correspondent rights, in a state of society, generally, without reference to particular customs and institutions.

It is discoverable by the light of reason.

Its obligation is the duty, which each man owes to his neighbour, of doing, in every case, that which is most conducive to the peace, good order, and well being of society.

Which is, as it were by way of eminence, the social compact; since society implies a consent, arising from necessity, to live together in peace.

The necessity, which produces the consent, is the natural authority which imposes the law of peace. Retaliation is the sanction by which the law is enforced.

This law is observed, or professed, by all nations in their mutual intercourse; and regulates the conduct of all moral men in civilized states, independently of the municipal laws.

It forms the basis of all municipal laws; not connected with unjust fiscal exactions, or superstitious incroachments on civil power; often supplies their defects, moderates, controuls, counteracts, and finally reforms them.

Its effects are, principally, observed in the laws respecting contracts, commerce and war; and its authority is universally acknowledged, and enforced, under the name of equity, in every civilized nation.

When municipal laws violate any of its fundamental principles, they gradually fall into disuse, and are necessarily evaded.

The origin of the law of nature and its sanctions, is differently accounted for, by different authors. They refer it to conscience, to an internal monitor, a moral sense, divine justice, the will of God, natural or revealed religion. But all these different views are equally just; inasmuch, as the peace and good order of society must be consentaneous to justice, whether it be stiled natural or divine; to good conscience; to every sense of morality, and religion, as well natural as revealed.

In every state is man subject to this law; which is operative, where all other laws are silent; and which is never violated without injury to society, through some individual; and, most frequently,

to the ultimate disadvantage, either of him who commits the wrong, or of his relatives and descendants.

The law of nature is, therefore, universal and inviolable. It is the law of nations, because with them, all positive law ceases; and, there being no superior authority to whom they can appeal, individual nations are like individual men living without municipal laws. They respect each other's rights, in the hope of preserving their own; they violate them, when their passions overcome their reason, and their dread of retaliation is diminished, through a consciousness of their own strength, or the imbecility of their neighbours. Thus they act with more or less justice, fraud, or violence, according to the disposition of their rulers, the spirit of the times, and the state of knowledge and civilization; which humanize their characters, moderate their ambition, and create a sort of refinement in moral sense amongst nations.

This law being discoverable only by the light of reason; being, in effect, the natural equity which results from an improved knowledge of the real organization of society, and of the true interests of mankind; is improved, regulated, and rendered operative and effectual, by the increase of knowledge, wisdom, and experience only. It preserves peace, and regulates commerce; it inspires active virtue; it encourages arts, promotes benevolence, mitigates warfare, and advances happiness, universally. Its essence is right reason; its end the well-being of man. It is the animating genius of all society. It is the main support of all civil institutions.

Yet it is for such institutions that some bewildered declaimers have pronounced, that man has yielded up his liberty, and quitted the freedom of a state of nature, to submit to the silken chains, or the galling manacles of society.

Absurd sophists! idle dreamers! Man is, by nature, social. In submitting to the law of nature, and the necessary institutions of order in society, he has yielded up nothing; he has quitted no freedom; relinquished no advantages.

He has exchanged, mutually, a pledge of security; bound himself reciprocally with others to contribute to their mutual happiness. He has knit, as it were, the union of peace and concord; by forming the natural compact of society and civil order, for the preservation of his life and freedom.

He is in a state of nature still; so far as he is governed only by wise laws, founded on useful, just, and equitable institutions, and the law of nature and right reason. For it is the first law of nature, that man should will his self-preservation, his individual happiness, and the good of his posterity.

It is this sort of tacit agreement to all the laws of right reason, which constitutes the true social compact; a compact which is the offspring of society, not its parent. For they err widely, who understand by it an agreement, previous to the existence of society; since society is necessary to the existence of man. And its compacts, as founded in nature merely, are necessary and purely beneficial.

If man has not gained, or if he has lost any thing in society, it has been by the combined effects of the ignorance of the many, and the subtle frauds of the few. The error is neither in man, in nature, nor in society, in general; but in particular frauds and individual usurpations, which reason and knowledge will in time redress.

DEFINITION OF MONEY.

1. Real money is made of silver, gold, or other precious metal, and is a commodity of intrinsic value.

2. It is raised by labour, and purchased with commodities.

3. Its real value is the price of such labour.

4. It is so durable as to be almost indestructible.

5. It is divisible almost to infinity.

6. It is used by the *convention* of all nations, and all ages, as the representative of all things wanted.

7. It serves as a pledge and surety that whenever the want of any thing vendible shall occur, it will be speedily gratified, by exchange for it.

8. Its name in Greek and Latin, is *nomisma*, and *nummus*, derived from *nomos*, a word signifying law; which indicates that it is in part founded on *convention*.

9. As this *convention* is universal, the law is a law of all nations, and a *law of nature*.

ARISTOTLE'S DEFINITION.

" Money, which represents the value of all other things, varies in its own; but the variations (meaning of real money) are less considerable than those of most other substances. It serves, therefore, to fix their price, and to render them commensurate with each other; thus performing a function essential to the

the existence of civil society: for community could not subsist without exchange; nor exchange without equality; nor equality without a common measure."

AXIOMS CONCERNING MONEY.

Variations in the value of Money.

1. Money, which represents the value of all other things, varies in its own.

2. But its variations are less considerable than those of most other substances.

3. It varies as the effective demand for it, and its own quantity or supply.

4. Both its quantity and its effective demand vary, as the commodities by which it is first purchased, and for which it is exchanged.

5. These exchangeable commodities vary in quantity and value as population and the productiveness and quantity of labour.

6. Its quantity and effect also vary as the number of exchanges or degree of its circulation; which varies as population, and as the quantity of commodities; which also varies as the distribution of wealth; as the productive arts; as commerce, and the arts of money-dealing; and as luxury and economy.

Money a good common Measure.

8. Money is a good common measure of all things in exchange. It is indeed the best known.

9. Exchange is essential to society.

10. Equality is essential to exchange, and money produces this equality.

11. The exchangeable value of money has a tendency to equality every where.

12. But it is never equal in all places; but is constantly fluctuating by the operations of commerce.

13. To illustrate it by a figure, money in commerce, is like the water of the ocean, which is elevated by the swell of the tides perpetually, has a constant tendency to subside into a level, and is therefore never stagnant or at rest.

Price and Value.

14. Price, is the money given for a commodity; and value in exchange, the commodity given for money.

15. Prices vary with the relative quantity of money, and the stock of commodities in the market.

16. The value of money is estimated by the quantity of commodities which it will purchase.

17. Prices determine this value.

18. Increase of money advances prices.

19. The advance of price is the diminution of the value of money.

20. Prices are steady or unsteady, when the demand and supply of commodities and of money are regular or steady, or the reverse.

21. Prices become steady, when money has got into circulation, and measured the price of many commodities.

Of Wealth.

22. Wealth is the possession of productive, permanent, and consumable commodities.

Symbol of Wealth.

23. Money, being a pledge or symbol of value, is a pledge of wealth.

Increase of Money Increase of Wealth.

24. The increase of money, as a pledge or *symbol*, can be no increase of wealth, until the wealth, which the pledge or symbol represents, is forthcoming. And while it decreases prices, it is no increase of wealth; but may become so, by exportation and the purchase of commodities, which are wealth.

25. The expectation of this increase may be called convertibility of money into wealth.

Commerce, what.

26. If prices are higher in one place than another, commodities will be carried from the one to the other, while the difference will pay the charge of conveyance.

27. This promotes trade and commerce.

28. Commerce tends to bring prices to a level.

29. The effects of commerce can only be impeded by financial and other restrictions; except such as are for the maintenance of good faith.

30. Commerce is necessary to the first introduction and continual supply of money.

31. It circulates money, and effects the exchange of commodities universally.

32. It tends to equalize the price of commodities, and the value of money universally; except as far as it is impeded by financial regulations.

Medium of Exchange.

33. Money is necessary to commerce as the medium of exchange.

34. Money is the incitement to commerce, by affording a ready and safe pledge of value and medium of exchange.

Money the chief object of Commerce.

35. Money, being considered as a pledge, or symbol of wealth, is the chief object of commercial exchange.

36. Money can pass from nation to nation only in exchange for value, in labour or commodities.

37. It is exchanged for commodities, when the price is higher where the commodities are to be consumed.

38. By

38. By the above axioms, 15, 18, prices will be higher where the relative quantity of money is greater, and where the productiveness and quantity of labour and skill in commerce are less.

Equalization of the Quantity of Money.

39. By exchange in commerce the relative quantity of money will be reduced or equalized.

40. As money is the pledge or symbol of wealth, commodities, being valued in money, pass from nation to nation in exchange, upon a sense of equality.

Of Foreign Expenditure.

41. Labour being valued in money, if any state, by convention, agree to perform certain offices of labour for another, as in war, money or commodities must pass to pay for it. The price of such labour is called a subsidy.

42. This, as well as the pay of armies and agents of the state in foreign countries, is called foreign expenditure.

43. Domestic trade occasions a circulation of money, in exchange for labour and commodities, and in payment of taxes, or the price of the labour of the state, the one for the other.

44. Foreign commerce effectuates the exchange of labour, or foreign expenditure, money and commodities; to which may be added the payment of rent and annuities, from the inhabitant of one country to the inhabitant of another.

True Balance of Commerce.

45. In trade and commerce, these articles must balance each other equally.

Commerce spreads Money.

46. The quantity of money which passes from one nation to another must be regulated by the supply from the mines, and by axioms 5 and 15.

47. Commerce equalizes this supply, and disperses the money raised at the mines all over the world.

48. The supply being definite the circulation of money cannot exceed it.

Balance of Trade.

49. The old notion of a balance of trade, meaning that an importation of money is the only beneficial trade, is absurd. Such an importation is useful, or otherwise, according as money is the real pledge or symbol of wealth.

50. As money comes into any country by commerce, in exchange for wealth or labour, it goes out, also, in exchange for wealth or labour.

51. A balance of trade invariably on one side cannot be paid in money; except where the country paying the balance possesses the exclusive property of the mines, or either an exclusive or superior trade with the country possessing the mines.

Credit defined.

52. Credit, in commerce, is a pledge of faith for the payment of money.

53. Credit gives an apparent increase to the quantity of money, as money does an apparent increase of wealth.

Bills of Exchange.

54. Bills of exchange and promissory notes are evidences of credit.

55. Increase of bills of exchange and promissory notes is an apparent increase in the effectual quantity of money.

56. Credit being a pledge for money, and money a pledge for wealth, wealth is increased by neither, till the thing apparently represented by them, that is wealth, is forthcoming.

Credit affects Prices.

57. Increase of credit, bills, and notes, increases prices.

58. Credit is ideal, and matter of opinion.

59. Credit does not vary, as the labour and commodities by which money is first purchased, nor as the productiveness and quantity of labour.

60. Increase of credit, and of bills and notes, is indefinite, and has no fixed or definite proportion to labour and commodities, or to their production.

61. Credit being ideal has no natural limit.

OF DEBASING COIN.

As coin, or money, is rendered less valuable, by diminishing either its weight or purity; it has frequently happened, that the ruling powers of every nation have, by all these methods, for particular purposes, and for temporary advantages, diminished the value of the coins, retaining their nominal values.

Although this is a plain fraud, the ruling powers in all states, in early times, have committed it. But there is reason to hope it will not be attempted again; at least, not for the same reason. Fraud is seldom long-sighted; and frequently injures itself. On a great scale it is productive of pure mischief, and is an advantage to no one. And so it has happened with the monarchs who have wantonly altered or debased their coinage.

What is the principle? The equality of exchange is broken, by attempting to make a guinea pass for half its value; or half its value be exchanged for a guinea. Society cannot exist without exchanges, nor

nor exchanges take place without equality. This is one of the first laws of nature, which are inviolable. No tyrant, however powerful, can break it. The equity of commerce discovers the fraud, and circulation ceases, till the error is corrected.

Paper money was introduced about the time when the monarchs of England ceased to debase the coin; and it has been resorted to by every state in Europe, and by the republic of America. Its mischievous effects have in many states been most severely felt; and it has then ceased to obtain any currency.

Notes are increased gradually, from day to day, and their effect is slowly perceived in the rise of prices. For such an increase of money necessarily raises prices. Land grows dearer; bread rises constantly; wages cannot keep pace with it; the poor starve; the rich find their incomes inadequate to their expenditure.

At length, the demands of the state increase rapidly; the money must be increased with equal rapidity; and prices rise as rapidly. With the rise of prices, the demands of the state increase; the pay of the army becomes insufficient; the army demands an increase; more new paper money must be issued; and prices still increase. The officers of the state require higher salaries; the army again demands higher pay; and more money is again made.

Till at last it is found that increase of money and rise of prices revolve in an endless circle. The money is increased; but not its effect. General discontent prevails; the ministers find it of no use to continue to struggle against the law of nature; which by the equality of exchange, constantly defeats their purpose. Justice is then resorted to, as the only policy which can restore public tranquillity; the coinage is reformed; and the state by adhering to good faith, recovers its equilibrium.

CIRCULATING MEDIUM.

Mr. Rose says nothing of country bank notes, and states the circulating medium of Great Britain to be,

In 1798, Coin	. .	£35,000,000
	Bank of England Notes	11,278,000
		£46,278,000
In 1811, Coin	. .	3,000,000
	Bank of England Notes	23,000,000
		£26,000,000

Mr. Johnstone points out this omission, and shows, that Mr. Rose should, on his own grounds, make our currency to be,

In 1798, Coin	. .	£30,000,000
	Bank of England Notes	11,000,000
	Country Bank Notes .	7,000,000
		£48,000,000

and at this time,

In 1811, Coin	. .	5,000,000
	Bank of England Notes	23,000,000
	Country Bank Notes .	32,000,000
		£60,000,000

Mr. Bosanquet calculates the medium,

In 1810, Gold	. .	£2,000,000
	Bank of England Notes	21,000,000
	Country Bank Notes .	27,500,000
		£50,500,000

Mr. Johnstone considers the country bank notes of 1l. and 2l. to amount to 12 millions, and he thinks all the country bank notes current to be,

In 1807 .	£26,500,000
1808 .	24,500,000
1809 .	29,500,000
1810 .	33,000,000

And Mr. Richardson says they are 30,000,000l. including Scotland. At the same periods were current, Bank of England notes,

In 1807 .	£17,500,000
1808 .	17,500,000
1809 .	20,000,000
1810 .	23,000,000

The number of country banks, including those in London and Scotland, in 1810, is shown, by particular enumeration, to be 796; and, reckoning the circulation of each at an average of 40,000l. their notes would amount to 31,840,000l.

Mr. Johnstone, founding his calculation on the number of stamps issued, makes the sum of the circulation of these banks to be 32,000,000l. By the same calculation, Mr. Johnstone considers the sum circulated by country banks in 1808 to have been 24,500,000l. The number of such banks in 1808 was 600 and upwards; and as the calculation at 40,000l. each, brings a similar result, it is reasonable to believe that the circulation may be safely assumed to be in that ratio.

Mr. Tritton, in his evidence before the Bullion committee, states his opinion to be, that the average of each bank might be 30,000l.; but Mr. Johnstone appears to go on stronger ground, as will appear from the following calculation of the amount,

amount, estimating by the number of banks, viz

			£
In 1793	280 at 40,000l. each	=	11,200,000
1797	230	=	9,200,000
1805	517	=	20,680,000
1808	600 or more	=	24,000,000
1808	796 exactly	=	31,840,000

Mr. Johnstone says, "combining the issues of the bank of England with the issues of private bankers, the whole paper circulation of the kingdom will be,

	£
In 1807 .	44,000,000
1808 .	42,000,000
1809 .	49,500,000
1810 .	56,000,000

but he omits to consider any other description of paper circulation.

Mr. Blake considers bills of exchange in a very limited degree, as circulating medium; but the amount of "paper circulation provided for, independant of bank notes," will appear deducible by calculations from the evidence before the Bullion committee. In this report it is shown, that every day a sum of four or five millions of paper in circulation is paid, with the use of only 220,000l. of bank of England notes, in fractional sums and balances, by forty-five bankers living in London; and that there are twenty-one bankers in London, with the bank of England, who separately discharge their engagements without attending at *the clearing house.* But if the daily balances were carried forward to one annual settlement, these bank notes could only be necessary for a single day in the year, and it might happen that the balances of demands would be of themselves equal. The whole sum of this private circulation may therefore become, in fact, wholly independent of the bank of England notes; and the following calculation will afford some proofs of the importance of this medium.

Calculating 360 days in the year at 4½ millions, the sum of paper engagements discharged daily at the clearing house by 45 bankers, will be annually	1,350,000,000
These 45 bankers will pay at their counters . .	150,000,000
The 21 bankers who do not attend, will pay . .	400,000,000
The bank of England, which had in 1810, as generally believed, 15 millions of discounted paper at, or under, 65 days' date, will receive back from individuals about 230,000l. per diem, or nearly, per annum, ...	70,000,000
The different trades in London who have no bankers, and all the acceptors in the country, which last in some parts of England, the city of Bristol particularly, are numerous, will pay very considerable sums, to be computed at	100,000,000
The bills drawn and made payable at the bank of England, by the agents of government, &c. and circulating till their maturity, may be	10,000,000
Other sums in bills paid at the bank on acceptances at their house, for the banks of Scotland, and their private customers, may be . . .	5,000,000
	£2,085,000,000

This amount, say 2,000,000,000, comprehends all bills of exchange paid in Great Britain, foreign and inland, and at all dates, from a few days to several years.

The whole of the circulating medium is calculated to serve two different purposes; first, in the transfer of land, or real property, and financial business, which required formerly a medium of coin, and now of bank notes; secondly, in commercial transactions, which require chiefly, and in many parts entirely, a circulation by bills of exchange. In the payments to government, however, the concerns of which may have been considered too many, and in those of the landed proprietor, whose concerns are perhaps too few, to admit of bills of exchange, they have not hitherto come into general use.

Assuming that the landed and financial circulating medium and the commercial are kept each distinct, the daily circulating medium of this country will be divided by the following round numbers:—

First, commercial medium, consisting of bills of exchange and paper, circulating on the credit of individuals . . .	£200,000,000
Bankers' notes not privileged, payable at different fixed dates, or on demand .	30,000,000
Second, landed and financial circulation, sale and rent of land, with hire for labour, and collection of	

taxes,

taxes, consisting of bank of England notes as a substitute for gold	20,000,000
Gold and other coin	5,000,000
	£255,000,000

In certain instances even government taxes are received in inland bills of exchange; and in payment of labour, and generally in payment of small amounts, the use of notes is common alike to all.

MORAL AND POLITICAL EFFECTS OF THE DEPRECIATION OF MONEY.

The increase of prices is the depreciation of money; which, if it occurs rapidly, either by the debasement of real money, or the increase of credit notes, injures all persons whose income consists of a mere annuity or stipend, and, by reducing the effect of their expenditure, reduces them in the scale of society.

Such persons consist, principally, of annuitants in the public funds, servants of the public, together with all officers of the excise and customs, officers in the army and navy, soldiers and sailors; except, in as much as some of these are partly supplied with food and clothing in camp, quarters, and garrisons, or in hospitals, and at sea. Add to these all clergymen living on small benefices, perpetual curacies, and rectories, supported either by tythes, under a *modus*, or a fixed stipend.

This depreciation of money, however, does not much affect traders of any kind, particularly the greater merchants; for the reasons stated already. Nor does it much affect those officers of state, whose salaries are accompanied with fees of office, and a per centage upon taxation.

It affects owners of land also, during the continuance of their leases. But they have a partial remedy, at the end of the lease, and, by reserving rents in corn or produce, will constantly be placed on an equality with all dealers in agricultural produce. It is probably, indeed, with the view of preserving to themselves the fair share of such produce, that so many gentlemen have been compelled, by the continual and rapid increase of prices, to become cultivators of land themselves. This will sufficiently account for the increase of agricultural pursuits amongst the gentry, and is a circumstance of no small importance.

This increase of prices occasions also an universally increasing demand for money, since every man finds his income daily less and less effective for the purpose of providing him with a supply for his support. It is in effect universal necessity, and brings with it all the virtues and all the vices of necessity. The latter probably far outbalance the former; for this increase of prices and of necessity breeds disquiet in every mind, and engenders speculative adventure in commerce, arts, war, politics, letters, and religion.

It may, indeed, be well conjectured, that such an increase of prices and disquiet disturbs the calm retirement of the religious establishments, which can exist only in tranquil and philosophic habits. For, by depressing the state of the clergy, it diminishes their influence, and gives encouragement to the innovation of more adventurous sectarians, who are frequently paid by contributions, and generally earn a decent subsistence, while many of the regular clergy are reduced to a state of great poverty. How much the depreciation of money must have effected this, will appear from the simple fact, that the value of 50l. a year at the reformation, calculated in our present prices, would be as 100 to 600 nearly, or perhaps 650; and, allowing 50l. a year for each living, which was the actual value of the majority of them at that time, it follows that, in order to maintain the clergy in their relative rank, no living or curacy should be below 300l. a year. That it is almost impossible to defend the church establishment against the influence of the great class of dissenters called methodists, will appear from considering the diminished value of church livings, and the activity of persons who, with the fervour of zeal, or enthusiasm, combine, in some instances, habits of gainful speculation.

It is clear, that this rapid increase of prices, by producing universal necessity, must operate many political and moral changes in the state. Its effects are, indeed, most severely felt by those who have the least means of increasing their incomes, by productive labour; such as the female part of society, the aged and the infirm. And hence arise not only the increase of poor rates, but that disquietude, restlessness and repining at our condition, which produce extravagance and luxury, gambling and adventure, in a greater degree, perhaps, than any other known cause.

In

In an increasing state of prices labourers and workmen demand more wages; and, as they cannot meet upon equal terms with their masters, who have a capital to support them, while their manufactories stand still; they enter into combinations, or form mobs and commit violences, which always give occasion to severe laws against such combinations, or laws to maintain a maximum of prices in labour.

For, it may be remarked, that such laws are found to have occurred, chiefly, when the currency was undergoing perpetual debasements; particularly, in the reigns from Edward I. to the 43d year of the reign of Queen Elizabeth. And now, when money is, in effect, similarly debased, by the issue of paper and the alloy of excessive credit, beyond the possibility of its convertibility into coin, their necessity and severity will increase. The evil is corrected in some measure, however, by the demand of men for the army and navy, particularly the former. These are the depositories of all the necessitous and turbulent spirits amongst the lower classes, who, in other states of society, would form private bands of plunder, and be driven to absolute depravity. The more degraded, however, necessarily become infamous in society, and make up in all states the gangs of robbers and petty thieves.

The increasing necessity of the times, as it is justly called, or the unnatural depreciation of money, offers temptations to clerks and persons in offices of trust, of all ranks and conditions public and private, to commit frauds. These are driven to great necessities, by having at first agreed to accept a bare sufficiency for support; necessity then increases, and frequently overcomes the sense of duty; added to which, by having the confidence and use of large sums, their estimate and measure of value is very deceptive, as to their own affairs.

OF THE BURTHEN OF TAXES, AND OF A TAX ON CAPITAL.

Taxes are the means by which all the funds for the expenditure of the state are raised, and these are applied either in the ordinary support of the persons employed in its service, or in some extraordinary expenditure on occasions of war and otherwise. The real effect of taxation is to appropriate a certain portion of all the labour of the nation, which alone is ultimately productive of wealth, to the support of those persons who are combined for the purpose of the government of the state.

Taxes ultimately resting in this appropriation of labour, can in reality bear only upon the annual production and revenue of the people, and cannot, without the most destructive, and unjust violations of private property, be made to bear on capital. We have considered labour as the only source of wealth, nationally considered, though an individual may possess wealth invested in houses, goods, money, or lands, which have all been acquired by labour originally, and by lending or employing these may be said to use his capital advantageously for the purpose of the new production of wealth. Labour and skill are alone the real sources of wealth; but it has been made a question what part of the national wealth ultimately bears the burthen of taxation. Locke is of opinion, that all taxes are paid by the land, and there is reason to think that, in a great measure, the proprietors of the land suffer the most by the heavy burthens of taxation, because indeed they are most capable of supporting the burthen.

The taxing of land raises the price of all its productions, as the taxing of commodities raises their price. Hence every man's income in money remaining the same, every tax must diminish the general consumption of the article taxed, and reduce the effective wealth of each individual. But, by the increase of currency and prices, and the improvements of skill in the productive effect of labour, this is in a great measure counteracted; and while the taxes are moderate a general equalization of the burthen is produced, and the people suffer little by taxes; except indeed the poorest individuals, whose present income is barely sufficient for support of life, and who, by the smallest deprivations, must be driven from existence.

By taxing the annual rent of land, the produce of land is increased in price annually, and the burthen distributed equally, not amongst the land owners merely, but amongst all the consumers of the produce of land. And by taxing commodities generally, the burthen is also distributed amongst the consumers of those commodities; so that in the ordinary process of taxation it bears entirely upon the annual production and consumption of commodities. Taxes are, therefore, ordinarily considered as raised

raised upon the revenue or yearly income of the people.

In some particular emergencies, when the amount of the taxes upon revenue are deemed insufficient for the support of the state, it has been proposed to augment them by a tax on capital. This, wherever it occurs, is the wildest vision of political ignorance that despotism and folly can invent; and we shall shortly demonstrate that it means nothing more than to raise the amount of the taxes beyond the endurance of a patient and degraded people; and that when it is attempted to be carried into effect by a tax levied in money, it ends only in the ruin of all landed proprietors, and the disappointment of the financial visionary by whom it is attempted.

When a tax is laid upon any commodity, it bears upon the whole existing stock; and is paid amongst the consumers, whatever be the monied amount of the tax: and as commodities which are consumable are never existing in the country beyond the natural consumption of the year, that is, beyond the quantity which will be sold to consumers within the year; a tax on commodities is necessarily a tax on the mere revenue of consumers, and can never be made a tax on capital.

Such a tax can only be levied by raising an assessment upon the supposed money capital of the people, and the landed proprietors. Now when this comes to be paid, if all persons were obliged to pay one-tenth of their capital in land, or money, or in land estimated in money, the most mischievous and ruinous effects must ensue; for the whole stock of money in circulation is just as much as is necessary to carry into effect the sales of the ordinary saleable stock of lands and commodities in the usual transactions of one or two of the days in which the sales are the most frequent. Any increase of these sales must render a greater stock of money requisite, or must reduce the prices. In the one case the effective quality of the money is not increased; in the other the owner of the commodity is greatly injured in the reduction of its price.

Now the capital of every individual in a nation is vested in a small stock of cash, but principally in machinery, commodities, lands, and houses, or debts; amongst which may be numbered the national debt in particular. To pay a tax upon capital, therefore [illegible] one would have enough in re[illegible]y, a corresponding quantity of [illegible]al capital must be brought to market throughout the nation, and as this would create an extraordinary demand for money, the existing currency would not be enabled to meet it, so as to keep the stock at the ordinary prices. The price of every thing must fall, or currency be increased instantly. Either, therefore, the people must sell a much greater portion of their real capital, to raise the assessment on their estimated money capital, or the nation must abate of its demand, and the tax become unproductive.

Suppose, for instance, the capital of the nation be estimated at 20 years' value of the income on which a tax is now paid, and which is probably not one half of the income of the whole population; it will then amount to 2,200,000,000l.: a tax of 10l. per cent. on this will be 200,000,000l. which if raised and paid by a quarterly assessment, would require a sum of 50,000,000l. to be paid into the exchequer quarterly. This would exhaust all the currency existing in the nation, and either that currency must be rapidly increased and depreciated, or the tax could not be raised. It is easy to be perceived that such a tax would not be paid. The land owner would sell every tenth acre at a very low price in money, and tender the amount in payment of the tax; or suffer it to be seized by the collectors. The government would be disappointed, but the money brokers, bankers, and jobbers, would amass wealth rapidly, as in the French revolution.

Such are the limits which nature affixes to the rapacity of state theorists, and such is the ignorance of those who, regardless of the effect of currency and circulation, must ever remain unacquainted with the true science of money and finance.

A tax on capital, raised in money upon any given assessment, it is certain, would produce nothing but ruin to the state, and destruction to its proposer. Such ignorance and such folly, produced most of the miseries of the French revolution, when loans were raised upon the estimated value of the national domains, which were brought hastily to market, and either fell rapidly in price, or were paid for in depreciated paper.

In any other country where a revolution is not already commenced, let but a tax on capital to be paid in money be enforced,

enforced, and the hour of revolution or of ruin is fixed. If a tax on capital can be raised, it must be levied in commodities and land, to be transferred to the state creditors, in some manner similar to that mentioned in the last chapter.

DEBASEMENT OF MONEY IN THE 18TH CENTURY.

Sir George Shuckburgh Evelyn has calculated the depreciation of money from the mean result of the prices of several of the most necessary commodities; and accordingly it appears that in the year 1700 the value of one pound might be expressed by an assumed number 238; that is to say, 238 pounds would then purchase a given quantity of such commodities; but in ten years after, 247 pounds were required to purchase the same commodities.

A.D.				£.	s.	d.
1700	$\frac{238}{238}$ =	1·0000	=	1	0	0
1710	$\frac{238}{247}$ =	0.9635	=	0	19	$3\frac{1}{4}$
1720	$\frac{238}{257}$ =	0.9260	=	0	18	$6\frac{1}{4}$
1730	$\frac{238}{267}$ =	0.8913	=	0	17	$9\frac{1}{4}$
1740	$\frac{238}{272}$ =	0.8750	=	0	17	6
1740	$\frac{238}{287}$ =	0.8311	=	0	16	$7\frac{1}{4}$
1750	$\frac{238}{314}$ =	0.7579	=	0	15	$1\frac{1}{4}$
1760	$\frac{238}{342}$ =	0.6800	=	0	13	7
1770	$\frac{238}{384}$ =	0.6197	=	0	12	$4\frac{1}{4}$
1775	$\frac{238}{414}$ =	0.5748	=	0	11	$5\frac{3}{4}$
1780	$\frac{238}{427}$ =	0.5574	=	0	11	$1\frac{3}{4}$
1790	$\frac{238}{496}$ =	0.4798	=	0	9	7
1800	$\frac{238}{562}$ =	0.4234	=	0	3	$5\frac{1}{2}$
1806	$\frac{238}{630}$ =	0.3777	=	0	7	$6\frac{1}{2}$

In like manner Mr. Arthur Young, in his Enquiry into the Progressive Value of Money in England, as marked by the price of agricultural products, gives twenty-one different items, by which he also estimates the value of money in separate proportions of one in twenty, making corn the principal.

A.D.				£.	s.	d.
1700	$\frac{388}{388}$ =	——	=	1	0	0
1766	$\frac{388}{438}$ =	0.8858	=	0	17	$8\frac{1}{2}$
1789	$\frac{388}{835}$ =	0.4646	=	0	9	$3\frac{1}{2}$
1800	$\frac{388}{844}$ =	0.4[illegible]97	=	0	9	$2\frac{1}{2}$
1803	$\frac{388}{1147}$ =	0.03382	=	0	0	8
1810	$\frac{388}{1640}$ =	0.02309	=	0	0	$5\frac{1}{2}$

Sir G. S. Evelyn's table gives the actual proportion of the value of money at stated times, by the actual price of corn; but Mr. A. Young denies the accuracy of his prices. He states the proportion in 1675 as 246, and for that of 1740 as 197, and for 1760 as 203, and for 1795 as 426. Making, therefore, 197 the standard from the year 1700 to 1740, we shall, in like manner as before, have the following debasements, viz.

A.D.				£.	s.	d.
1700	$\frac{197}{197}$ =	——	=	1	0	0
1740	$\frac{197}{197}$ =	——	=	1	0	0
1760	$\frac{197}{203}$ =	0.9704	=	0	19	$4\frac{3}{4}$
1795	$\frac{197}{426}$ =	0.4024	=	0	9	$2\frac{3}{4}$

Taking, however, Sir G. Shuckburgh's table for the basis of our calculation, it will be easy to compare the advantage which might have been made by purchasing a farm of 100l. a year in 1700, and selling it in 1806, instead of laying out the same sum on mortgage, and recalling it in the same year. The farm would in 1700 have cost 2000l. at twenty years purchase, would have produced 10,000l. in rent, equal to the money of 1700, and would have sold for thirty years purchase on the actual rent, which would have borne a proportion inversely to the 100l. of original rent, as 0.4234 or 8s. $5\frac{1}{2}$d. would have borne to 20s.: that is, the rent would, at the resale, have been 236.8, and the price of it at twenty-eight years purchase, would have amounted to 6619l. 4s. or thereabouts.

The value of the annuity will require a nicer calculation, which will be most easily performed by the decimal values given in the former table. Thus, to ascertain the amount of the receipts, we must multiply the value of one pound by one hundred, for every year, and that by ten for each ten years, or to save trouble by 1000, and adding the results, we shall have the total receipts in pounds and decimal fractions as follows:

		£	s.	d
From 1700 to 1710		1000	0	0
1710 to 1720	0.9635	963	10	0
1720 to 1730	0.9260	926	6	0
1730 to 1740	0.8913	891	6	0
1740 to 1750	0.8311	831	2	0
1750 to 1760	0.7579	757	18	0
1760 to 1770	0.6800	680	0	0
1770 to 1780	0.6197	619	14	0
1780 to 1790	0.5574	557	8	0
1790 to 1800	0.4798	479	16	0
		£7606	0	0
Price 2000l. received in debased money of 1800, valued at 4234, or 8s. $5\frac{1}{2}$d. in the pound.		847	12	0
		£8453	12	0

The debased value of 100l. in a curacy, rent or annuity, may be taken from the foregoing calculations nearly as follows:

Debased	£	s.	Necessary	£	s.
value 1700	100	0	increase	100	0
10	96	12	- -	103	16
20	93	6	- -	107	18

	£	s.		£	s.
17[illegible]0	89	2	- -	112	4
40	83	2	- -	120	6
50	75	14	- -	132	2
60	68	0	- -	147	12
70	61	18	- -	161	10
80	55	14	- -	179	10
90	47	13	- -	208	14
1800	42	6	- -	236	4

The first column of this table shews the real value estimated in the currency of the year 1700, which the stockholder, annuitant, mortgagee, pensioner, or curate has received; and the second, the amount in nominal value, which he ought to have received to have kept his income at the same real and effective value.

THE AUTHOR'S SUGGESTIONS.

It may naturally be asked whether any results practically useful can be drawn from the facts and theories contained in the foregoing treatise; and the author feels it necessary to state some which are applicable to the present crisis, for various reasons: first, that he may not be deemed deficient of sensibility to the welfare of his country; and secondly, that he may neither be taken for a gloomy misanthrope, nor an enthusiastic speculator. All that he can offer is calm opinion, founded upon the foregoing examination, to restrain eager rashness and check headlong folly.

The advantages and disadvantages of a paper system, have been fully examined and clearly illustrated. In as far as it has enabled commercial men to borrow a capital of all the rest of the community, it has extended commerce, and, while it depreciated money rather slowly, it improved manufactures, provided employment for the poor, and rendered cheap many useful and necessary commodities. This was its principal operation from the peace of 1783, to the year 1797; but, since that time, it has chiefly assisted in the support of war, and the increase of taxes; and now that the commerce of Europe and of America is excluded from the British isles, manufactures are rapidly falling into decay, and merchants sinking into bankruptcy.

This must continue, till the state of trade and manufactures is reduced to the level of domestic consumption, and the labourers who are without work, and without food, have found either new means of subsistence, employment in the armies, or rest in their graves; unless peace should speedily open new outlets of commerce, and revive, ere they sink for ever, those manufactures which were so lately the pride of Britain, and the envy of the world.

In the years 1797 and 1798, the bank of England repeatedly offered to recommence its payments; but the great financier of that day, a man who, since his death, has received the apotheosis of immortality, the late celebrated Mr. Pitt, forbade them; and many are those amongst his admirers, who now regret that his voice was obeyed, since the measure of justice which was then deemed easy, is now considered almost impossible.

The difficulties of restoring coin have been fully examined in this work, and they are so far insurmountable, that probably few who read it will expect its speedy accomplishment. But the power which laid its seals upon the coffers of the bank, will, in due time, be compelled of necessity to remove them: for those who direct the councils, who collect the revenue, and who wield the sword of the state, will discover, in the end, that, by excluding coin from circulation, they wage a destructive war against themselves.

It is then that the laboured investigation of the present work will be found useful, in pointing out all the difficulties and many of the distresses which must ensue from the restoration of coin, an event that cannot take place without a sudden and universal change of value in all articles bought and sold for money: attended with the utmost confusion in the liquidation of all debts and credits, and in the payment of all taxes, customs, duties, rents, and annuities.

In the mean time, all that sobriety and prudence can devise, is to direct the attention of the legislature and its committees, as well as of all commercial men, and all proprietors of land, as well as public stock, to prepare themselves for encountering the evil which they cannot prevent, and to provide such regulations for the emergency as may give to equity and justice some controul in the midst of confusion, and prevent the entire usurpation of wild unbounded anarchy.

Till this preparation is made, the bank restriction ought not to be removed, either in peace or war. When it is made, the restriction may be removed at any time. In the interval let the bank manage its own concerns without the interference of the state, except so far as may be necessary to ascertain the quantity of bullion in its possession, the circulation

culation of its notes, and the necessary particulars relative to the public funds and the sinking fund; but all restraints upon its issues must, of necessity, be futile or mischievous.

The solvency of the bank is unquestionable, and results from the nature of its constitution; but the power of converting all its paper into gold is, from the same cause, at all times chimerical: for it has been seen, that its debts may be liquidated entirely without money, by simply retiring its bills, though its stock of bullion remain untouched in its coffers. This is a sacred deposit which should on no account be violated. It constitutes at present the real wealth of the bank proprietors, and will in the end be found the sheet anchor of the national currency. It will enable the state to distribute a portion of coin universally and equably through the country, upon the first abandonment of the paper system. How to dispose of this fund most usefully, without violating the property of the holders of bank stock, is amongst the most necessary objects of national attention. How to liquidate the debts and credits of individuals justly, and without universal insolvency; how to rescue tenants, and the granters of annuities from inevitable ruin and confusion; how to regulate taxes, funds, customs and pensions, with equity, upon the sudden change of currency; how to maintain some equality of proportion between the prices of corn and grain, compared with manufactures, during the influx of gold from the continent, are all questions which will demand the utmost skill, prudence and foresight in the minister, whose arduous duty it shall be to preside over the councils of the state, in the great revolution of property, which must follow immediately upon the opening of the payments at the bank.

To decree this opening, it has been seen, is simply to withdraw for a time, the paper currency of the bank of England, and by that means to close the shops of all the seven hundred provincial bankers, whose minor streams are fed from the great metropolitan spring of paper currency.

Its first consequence will be to deprive the people of all circulating medium, and the merchants, manufacturers, and great agriculturists of the principal part of their capital. Those who have witnessed the temporary embarrassments of a provincial town, upon the failure of a country bank in its vicinity, and the want of silver at a country market during the autumn of 1811, may form a faint picture of the national confusion which this first consequence must immediately produce.

Yet this decree is already pronounced by the legislature, and the era of peace is to be the harbinger of all the confusion which must inevitably ensue within six months after a definitive treaty, by the present provisions of the bank restriction act.

To introduce a new currency, is a subject of entirely different and subsequent provision. New paper will not pass, at least in the beginning; for what paper can be devised upon a better principle than that which is now current, and what promises of payment in coin can be relied on with certainty, when no one can estimate the proportionate influx of bullion, and the progressive change in the money value of all vendibles? The author has formed some schemes for the facilitating of that ancient barter which is the foundation of all exchange; and which, in the natural state, preceded the introduction of money; but, though this seems the true course of exchange, upon the sudden relinquishment of the advantages of a money circulation, yet all such schemes are complex, difficult, and of uncertain efficacy.

In this difficulty, great as it is, the stock of bullion in the coffers of the bank, whatsoever its amount, will be found, as before stated, the sacred fund of national salvation. In the administering of this fund, this miraculous remnant of the food which is to appease the craving necessity of millions, the wisdom, the prudence, the fortitude of the government, and the good disposition of an industrious people, will be put to a severe trial; and the author is somewhat sanguine in his hopes, that, in that eventful period, the rulers and the people will derive much assistance from the plain principles and undoubted truths contained in this volume: in which he has endeavoured to analyse, with scrupulous fidelity, all the principles, and detect all the mysteries of every various medium of circulation, hitherto used amongst civilized nations.

It is with this hope, that he commits it to the world, confident of his own honest intentions, presuming only upon the utility of patient labour and industrious sincerity, little anxious whether he is deemed the advocate for paper or for gold; but desirous that, if he shall be esteemed

esteemed the prophet of evil rather than of good, he shall be allowed to have stated adverse prognostics only to render the patient submissive to the curative process of the state physician; that, if he has probed the deep and sinuous wounds of the state with severity, he has touched to the quick, only to guide the master surgeon the more safely in the painful operations of his skill.

He has kept nature and her law in view through all his labours, and he has endeavoured to pronounce her decrees as the true guide and principle for the rulers of all states. If reason and nature have really dictated his opinions, he has confidence in the wisdom of parliament, and the justice of the nation to believe that his humble voice will not want attention. If he is in error, the test of experience will soon detect his fallacies; for his principles, unlike those of many others, are definite, tangible, experimental, and demonstrative. At all events, he has performed a duty, which long reflection had induced him to consider as imperative. He has given the warning to his countrymen; the result is beyond the reach of his philosophy, and for the event he can only wait with patience and resignation. He commits himself, under providence, to the stream of time, and the hope of futurity; deprecating the censure of enmity, and the outcry of prejudice, with an humble prayer, that if he shall have spoken, according to his intentions, the voice of truth, and the dictates of sound policy, he may not be numbered amongst those who have prophesied in vain, and that it may not be recorded hereafter in the history of his countrymen, as in that of Troy,

Nunc etiam fatis aperit Cassandra futuris
Ora Dei jussu, non unquam credita Teucris.

AN

ACCOUNT OF IRELAND, STATISTICAL AND POLITICAL.

By EDWARD WAKEFIELD.

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[The fertile kingdom of Ireland, forming the second division in point of importance, of the extended *English* empire, has till within these few years been less known to the rest of the civilized world than New Holland or New Zealand. The writings of Mr. Young, Dr. Beaufort, Sir John Carr, Mr. Plowden, and others, served however but as precursors to the copious and satisfactory details of Mr. Wakefield. This gentleman has not merely *described* Ireland in the work before us, but has furnished a complete library on every subject connected with its interests, on which information can be sought by the naturalist, moralist, or politician. The reflections which his work has produced on our minds, after its attentive perusal, are, that the British government, and the partisans of the British ministry, who affect to be so deeply concerned for the liberties of Spain, Portugal, Germany, Holland, &c. would act more patriotically, and afford more unequivocal proofs of their attachment to the liberties and happiness of mankind, *by looking nearer home;* and that, if they are disposed to employ their resources in ameliorating the condition of nations, they would act wisely in *looking to Ireland,* —without wholly forgetting *England, Wales,* and *Scotland.* Those who seek after truth, and who wish to feel in its full force the justice of these sentiments, should consult the bulky volumes of Mr. Wakefield; of whose merits and labours as an author, we present a very meagre sketch in the valuable extracts which follow.]

ARTHUR YOUNG.

In agriculture, one important part of this undertaking, I felt from the beginning some degree of confidence in my own strength; my attention having, for many years, been directed to the value and management of land, of which I have seen and examined much in many of the counties of England. Mr. Young has remarked, that to prosecute a work of this kind with effect, requires a combination of agricultural and political knowledge, sufficient to discover the best means of employing the productions of the earth, and of applying them in such a manner as to promote the happiness of the people. These are the acquirements which far surpass the information possessed by the mere farmer; or those of the politician, whose only purpose is the accumulation of the taxes and the resources of the country. Properly to execute such a task requires greater talents and knowledge than is commonly to be found in the same individual. England, however, in Mr. Young, may boast of such a person; his labours will shed a lustre on her fame through future ages; but truth compels me to declare, although the assertion may reproach my country,

country, that he has been ill requited for his exertions in her service, and that during the best days of his life, she seems to have been coldly insensible to the value of his indefatigable and important labours.

Perhaps, it may not be quite relevant to my present subject to enlarge farther on this topic, but having just read Dr. Clark's attack upon Russia for her ungrateful conduct towards Professor Pallas, it has roused my feelings in recollecting the situation of Mr. Young. In early life he produced his Political Arithmetic, a work which, in the opinion of many very able persons, is to be classed with the profound researches of Sir James Stewart, and the eloquent disquisitions of Dr. Adam Smith. Previously to his writing this book, he had made England much better known by the publication of his Three Tours, and in 1779 he began his Irish work, in which he pointed out the folly of the bounty on the inland carriage of corn. His recommendation on this subject was adopted; and, from that hour, may be dated the commencement of extended tillage in Ireland.—*See Annals of Agriculture*, vol. xxix. p. 167. His masterly observations on the penal code of laws against the Roman Catholics, in which he proved that they were not laws against the religion, but the industry of the country, have been frequently quoted, both by writers and public speakers, as authority for the repeal of those obnoxious statutes; and his advice to a considerable extent has been followed. He foresaw the benefits of an union, and that union has taken place. Had the many minor details which he recommended, been acted upon, Ireland at this time would no doubt have been in a very different situation. His tour in that country was a labour of some years. Mr. Young wrote much in, and edited the Annals of Agriculture, a work of forty-five volumes, and of so much importance, that the great Bentham has said, that whilst he possessed a guinea, he would not be without it.—*See Mr. Bentham's Letter*, ibid. vol. xxix. p. 393. Mr. Young's Farmer's Calendar now goes through an annual edition; a striking proof of its merit and very great utility. His French tour stands unrivalled by any work of its kind in any language. His Essay on Manures, for which the Bath Society awarded him the Bedfordian prize, exhibits his intimate acquaintance with chemistry; and his reports of Essex, Suffolk, Norfolk, Lincolnshire, Oxfordshire, Hertfordshire, &c. afford the most evident marks of his talents and industry. Elected a member of many learned societies, some of them beyond the Atlantic; the friend and associate of the greatest men of the age in which he has lived, generously imparting to all persons the result of his accumulated store of knowledge, Mr. Young has spent a long life in cultivating and promoting the arts of peace. Contemning all private emolument, and serving the public without any view of adding to his private fortune, he has received, I believe, from his country, no other reward than that of being appointed to the office of Secretary to the Board of Agriculture, with the small salary of 400*l.* per annum. Such, reader, is the extent of the boon conferred upon this benefactor of mankind! It is posterity now which must do him justice; and some future biographer, in speaking of his services, may, perhaps, be inclined to remark, that his country behaved to him as Frederic boasted he had done towards Voltaire—"he treated him like a lemon; squeezed out the juice, and then flung away the rind."

ANTIQUITY OF IRELAND.

Whether Ireland was known to the Phœnicians, who frequented the coasts of Cornwall for the purpose of procuring tin, is uncertain; because no authentic information on that subject has been preserved. The earliest notice, perhaps, to be depended on, which we have of it, is that of Eratosthenes, librarian to Ptolemy Philadelphus, king of Egypt, who flourished about two centuries and a half before the Christian æra. The works of this eminent mathematician and geographer have been lost; but Strabo, who frequently refers to them, and who seems to have been indebted to him for many observations, praises his private collection of books, and remarks, that he was so well acquainted with the western parts of Europe, that he determined the distance of Ireland from Celtica.

The first Roman author who speaks of it is Cæsar: he calls it Hibernia, a name said to be given to it by the Romans on account of its supposed coldness; and he states it to be half the size of Britain, and to lie at the same distance from it that Britain does from Gaul. It is mentioned also by Tacitus, in his Life of Agricola, under the same name; and various writers who lived at later periods describe it under those of Ierna, Ierne, Iuverna, and Ivernia.

Diodorus

Diodorus Siculus, who travelled over a great part of Europe and Asia to collect materials for his history, gives to Ireland the name of Iris; a word which is to be found in no other Greek or Roman author. Some, therefore, have considered it as a mistake: but a learned antiquary seems to think that this was the genuine name of the island; and indeed the proofs which he adduces in support of his opinion appear to me to deserve particular attention. "Iri, or, as now written, Eri, in the Irish, is the great isle. In Teutonic Er-aii, contracted into Eri, is the farther isle. It received this appellation from the Teutonic tribes, who formerly possessed Europe, and has been invariably used by them in every age."

A.D.

"540, Gildas left the school of Iltutus in Wales, and went to Iris.

870, In Islands Landnamaboc, one of the oldest Icelandic Sagas, Ireland is named Ir-land. In King Alfred's Anglo-Saxon translation of Orosius, Ireland is styled Ireland.

891, Three Irishmen, says the Anglo-Saxon Chronicle, came in a boat from Yr-land.

931, In the same record under this year, Ireland has the same name.

1048, In the same chronicle Harold flies to Yr-land.

1076, Adam of Bremen has the same name.

1105, Ælnoth in his Life of St. Canute calls the Irish Iros.

1401, Odericus Vitalis styles the Irish Irenses, and their country Ireland.

"And in Wormius's Runic Literature, the Irish alphabet is called Ira-letur. The identity of Diodorus's Iris with the Iris, Ira, Iros, Irenses, Ire, and Ir, of the Gothic and Teutonic people, and that traced for above six hundred years, clearly evinces that this Greek author has preserved the genuine and original name of the island."

ITS AREA.

I have measured with some care the area of Ireland, on the best maps, and make the superficial content of it, including the inland lakes, to be as follows:—

English Sq. Miles.	Irish Acres.	English Acres.
32,201	12,722,615	20,437,974

GLOSSARY OF NAMES.

As the following glossary, or explanation of some of those words which most frequently occur in composition, with the names of places in Ireland, may render these names more intelligible to an English reader, I have taken the liberty of copying it from Dr. Beaufort's Memoir.

Agh, a field.
Anagh, or *Ana*, a river.
Ard, a high place or rising ground.
Ath, a ford.
Awin, a river.
Bally, or *Ballin*, a town or inclosed place of habitation.
Ban, or *Bane*, white or fair.
Beg, little.
Ben, the summit of a mountain, generally an abrupt head.
Bun, a bottom, a foundation or root.
Car, or *Cahir*, a city.
Carrick, *Carrig*, *Carrow*, a rock or stony place.
Cork, *Corragh*, a marsh or swampy ground.
Clara, a plain.
Crough-Croghan, a sharp-pointed hill resembling a rick.
Clogh, *Clough*, a great stone.
Curragh, a marshy or fenny plain.
Clon, a glade or level pasture ground.
Col, *Cul*, a corner.
Derry, a clear dry spot in the midst of a woody swamp.
Don, a height or fastness, a fortress.
Donagh, a church.
Drom, a high narrow ridge of hills.
Inch, *Inis*, an island.
Ken, a head.
Kill, a church or cemetery.
Knock, a single hill, or a hillock.
Lick, a flat stone.
Lough, a lake or pool.
Magh, a plain.
Main, a collection of hillocks.
More, large or great.
Rath, a mount or entrenchment, a barrow.
Ross, a point of land projecting into waters.
Shan, old.
Sliebh, a range of mountains, a hill covered with heath.
Tack, a house.
Temple, a church.
Tom, *Toom*, a bush.
Tra, a strand.
Tobar, *Tubber*, a well or spring.
Tullagh, a gentle hill, a common.
Tully, a place subject to floods.

MOUNTAINS.

MOUNTAINS.

		Feet.
Curranea, Toohill, or M'Gilleycuddy's Reeks	Kerry	3695
Mangerton, ditto		2693
Sliebh-Donard, Down		2809
Nephin, Mayo		2630
Crow or Croagh Patrick, ditto		2660

SOIL.

The surface of Ireland affords no great diversity of soil. Sand is never seen except in places on the shore; chalk is unknown, and tenacious clays, such as those found in Oxfordshire, in some parts of Essex, and throughout High Suffolk, I could never meet with, though in the opinion of many around me I was standing on perfectly "stiff clay," an appellation given by the Irish to argillaceous soils. That clay may not exist in Ireland I will not venture to assert; but it is not at the surface, as is often the case in various parts of England.

Such kinds of flint as are common in Kent, Surrey, and Hertfordshire, are scarce. The greater part of the island abounds with limestone or calcareous gravel; few of the counties are without either the one or the other. The former is a useful production, and is converted into a source of wealth that will always be employed with advantage. The space occupied by the mountains and bogs, when compared with the whole area, makes a great diminution in the productive acres of the kingdom. In the north the quantity of rich soil is not very considerable, yet vallies of extraordinary rich land are to be found in every county; and I was not a little astonished, amidst the rocky and dreary mountains of Donegal, where there was hardly a vestige of cultivation, to find myself drop all at once into a district where the soil was exceedingly fertile. I am inclined to think that the general cultivation of flax is a pretty sure indication of rich land, as this plant, in poor ground, would never attain to perfection.

BOGS.

In England a very mistaken notion prevails, that the bogs of Ireland are found only in low situations, and people in general have thence been led to compare them to the marshy fens of Norfolk, Cambridgeshire, Lincolnshire, and Yorkshire, in which so much has been done during the course of the last thirty years. The bogs of Ireland, indeed, are widely different in many respects from the fens of England, as I shall shew hereafter, but they are capable of much improvement, were the system which has been pursued there changed, and a little of the English spirit transfused into some of the Irish landholders.

The soil of the English marshes "is a black spongy moor of rotten vegetable matter." The bogs of Ireland "consist of inert vegetable matter, covered more or less with unproductive vegetables, and containing a large quantity of stagnant water." The difference between these soils is, that the rotten vegetable matter of the one produces unrivalled crops of grass, corn, &c. while the inert vegetable matter of the other, throws out no kind of plant useful to man.

"The countess of Moira, in a letter published in the Archæologia, mentions that a human body was found under moss *eleven feet deep*, on the estate of her noble husband. The body was completely clothed in garments made of *hair*, which were fresh and no way impaired; and though *hairy* vestments evidently point to a period extremely remote, before the introduction of sheep and the use of wool, yet the body and the clothes were no way impaired."

According to a report made to parliament by a board of gentlemen appointed to examine the bogs in Ireland, it is estimated that they cover at least one million of acres; but as "mountain bog and bog under five hundred acres" are excluded from the computation, the surface covered by them is, perhaps, much greater. The commissioners conclude that six-sevenths of the bogs of Ireland occupy a portion of the island somewhat greater than one-fourth of its whole superficial extent, included between a line drawn from Wicklow Head to Galway, and another drawn from Howth Head to Sligo, resembling in form a broad belt, stretched across the centre of the country, with its narrowest end nearer to the capital, and gradually extending in breadth as it approaches to the western ocean. This district includes a number of bogs, called in general the "Bog of Allen," which, contrary to the prevailing opinion in England, is not one continued morass of immense extent, but consists of a number of bogs adjacent to each other, and all contained within the belt described by the commissioners. They all, however, lie on the west side of the Shannon, and are for the most part of that kind called red bog, being very different in appearance from the deep black bog found to the south of Lough Neagh, in the province of Ulster, or the high mountain-

mountain bogs which I have seen in almost every part of the island.

ORIGIN OF BOGS.

The origin of these masses of inert vegetable matter has given rise to many learned antiquarian and philosophical discussions, and notwithstanding all the modern discoveries, it appears to me to be still undetermined when or by what means they were formed. That they are not primitive or original masses of earth, I think, is certain, because they are found chiefly in northern countries, and always cover timber, various utensils, and coins, the two latter of which are certain indications of the hand of man, previous to their existence. I have seen fossil timber, in great quantities, dug up from many of the bogs in Ireland; and it is found also in all bogs in every country of Europe. From this circumstance, many have been induced to believe, that bogs originate from decayed forests, which by some accident or convulsion of nature have been overturned and buried. Mr. Griffith, who was employed by the Irish commissioners to survey a considerable extent of bog, states, in his report, "that those bogs which fell under his observation were not produced by any cause of this kind, as trees, or the branches of trees, are rarely found in the interior of the deep and extensive bogs of Ireland, but are always met with at the edges, or near gravelly hills or islands in these bogs, lying horizontally, and in no particular direction; frequently crossing each other, and either attached to their roots or separated from them. In the latter case the stumps usually stand upright in the place where they grew, having six or eight feet of the bog sometimes above them, and three, four, or five feet, but rarely more, below their roots." It is difficult to account for this circumstance, and therefore I am inclined, without ascribing the origin of bogs to decayed timber alone, to consider it as one of the chief causes of their formation. Dr. Anderson has combated this opinion, but I do not think with success. Mr. Griffith says, "trees are still to be found growing on the bog edges, and in the valleys in the bogs where rivers flow. Thus, in the vale of the stream running from Lullymore by Lullyby to Cushaling, in Lullymore bog, oak, alder, aspen, birch, willow, whitethorn, and holly trees, are now growing; but I did not observe any fir-trees, though they are found in the bog." Mr. J. A. Jones, another of the engineers employed by the commissioners, reports, that "in the borings taken to ascertain the depths of the bogs in this district, no timber was met with under the surface except near their edges, and it was usually oak, deal, or yew." Mr. Edgeworth, employed also as an engineer, speaking of the district which he examined, says, that "it forms a considerable section of a large circular bason surrounded by hills rising in the counties of Leitrim, Longford, Cavan, Westmeath, and Roscommon. It is probable that these hills, and the valleys between them, were covered formerly with trees, and from the remains and exuviæ of these woods, the bogs which at present exist have gradually been formed, fresh vegetation adding to the original morass. Whether these morasses were at first formed by the destruction of whole forests, or merely by the stagnation of water, in places where its current was choked up by the fall of a few trees, and by the accumulation of branches and leaves carried down from the surrounding hills, is a question that cannot now be determined. Professor Davy is of opinion, that in many places where forests had grown undisturbed, the trees on the outside of the woods grew stronger than the rest, from their exposure to the air and the sun, and that when mankind attempted to establish themselves near the forests, they cut down the large trees on their borders, which opened the internal part. When the trees were too weak and slender to withstand the influence of the wind, which, as is commonly to be seen in such circumstances, had immediate power to sweep down the whole of the internal part of the forest, the large timber obstructed the passage of vegetable recrement, and of earth falling towards the rivers; the weak timber in the internal part of the forest, after it had fallen, soon decayed, and became the food of future vegetation. Mr. Kirwan observes, that wherever trees are found in bogs, though the wood may be perfectly sound, the bark of the timber has uniformly disappeared, and the decomposition of this bark forms a considerable part of the nutritive substance of morasses. Notwithstanding this circumstance, tannin is not to be obtained in analyzing bogs. Their antiseptic quality is, however, indisputable: for animal and vegetable substances are frequently found at a great depth in bogs, without their seeming to have suffered any decay. These substances cannot have been deposited in them at a very remote

remote period, because their form and texture is such as were common for centuries ago. In 1786 there was found, seventeen feet below the surface of a bog in my district, a woollen coat of coarse but even net-work, exactly in the form of what is now called a spencer. It fitted me as well as if it had been made by a modern tailor. A razor with a wooden handle, some iron heads of arrows, and large wooden bowls, some only half made, were also found, with the remains of turning tools. These were obviously the wreck of a workshop, which had been probably situated on the borders of a forest." Mr. William Trench of Cangor Park, near Roscrea, in a letter I received from him, dated October 25th, 1810, says, "bog timber, for the most part, is found in this country to lie from south-west to north-east, which I think may be easily accounted for, if we suppose it to have been thrown down by the prevailing wind of the country, for all the trees here are found to incline in that direction, owing to the frequency of the wind from the west or southward. The timber which I have found, but in particular the oak, appears to have lain for very different periods. In general it is quite black, but I have found some in which that hue was only an inch deep, and the remainder of the brown colour usually exhibited by timber cut in our own time. Since you were in Ireland, a lake, which you may possibly have observed between this place and the house of my brother, has been drained so far, that the surface of the water now stands about four feet below its former level; more than one half of it has been left dry, and it appears that three-fourths of its banks are bog. The bottom consists of blue shelly marl, which seems to extend to a great depth, and when dry it is exceedingly light. In the highest part of this reclaimed land, which is about the middle of the old lake, there is seen a circular part resembling in shape the top of an immense tub, about sixty feet in diameter. The large planks which form the staves are from one to ten feet broad, and about six inches thick, quite straight as far as it has yet been possible to trace them downwards. None of them have been raised without cutting them. At present there is no appearance of either ax or saw having been used in the formation of them."

In a bog belonging to Colonel Heyland, in the county of Derry, there was found, under a large tree which some men were raising, a considerable quantity of matter resembling coagulated blood, a part of a man's hat, and an instrument which might be used for picking pockets, as it folded up into a small space; it had handles like a pair of scissars, and when opened darted out to the length of a yard, exhibiting a long hook at the end. I heard at Colerain of a corpse being found in a bog with its clothes and shoes on, together with shoemakers' implements, which seemed to indicate that the body was that of some shoemaker.

In the county of Kerry, great quantities of pine and birch timber are found in some of the bogs; in others there are no trees. Mr. Ensor, of Ardress, county of Armagh, says, in a letter which I received from him, "Do you know that the trees found in the bogs have been burned down? There is now in my yard a fir-tree of considerable dimensions, one-third of which was burnt; and I have had in my possession also oak-trees which were incrusted with charcoal." Some arrow-heads, wooden bowls, three sacks full of nuts, and a coat of an ancient texture and construction, were, in the year 1737, dug from under a moss fifteen feet deep in Kilkenny, all of them in a high state of preservation. Oak and fir, still fresh, were found in a bog south of Knoctopher.

"That bog may sometimes exist beneath other strata, and at a good depth from the surface, appears from the following fact, which was stated by the proprietor, Mr. John Prior, who in sinking a pump lately near his house at Kilree, eight miles from Kilkenny, discovered a bog having timber under it at the depth of thirty-three feet. He found the following strata:—vegetable earth three feet; marl with black stones, fifteen; yellow clay and hard gravel, fifteen; making altogether thirty-three feet, and with ten feet of bog below the whole, forty-three. Beneath was a mixture of gravel, with clay exceedingly hard, and immediately under the bog lay a large block of wood, a piece of which was sent to the Dublin Society, and appeared to be oak." In Kildare, "Mr Bagot of Nurney discovered at the depth of six feet under the surface the remains of an old plantation of fir timber; wherever he found a second in the line of drain, he was sure at the end of every ten feet to meet with a fallen tree. When these were removed, he sunk the drain six feet more

more to the gravel, where he found that there had been a promiscuous growth of trees.

GEOLOGY.

Ireland is said to be formed of one immense rock, or bed of granite, which is seen bursting out in some of the high and primitive mountains. Of this primitive granite, a part of the central mountains of the county of Wicklow seem to be formed, and also the ridge of mountains which separate the county of Wexford from the county of Carlow. This kind of stone, indeed, abounds in many of the counties; where it is applied to various purposes in building and architecture. In Kilkenny it occupies that portion of the county which lies chiefly between the Nore and the Barrow, and is found of various shades, grey, red, and yellow. In the fineness of its grain it exhibits considerable difference, but some of it is very coarse. The best is raised from a quarry at Mount Loftus; it is a beautiful stone of a light yellow cast, fine grained and compact. It can be taken up in blocks of a very large size, and wrought into any form by the chisel. It is used mostly in single pieces for gate-posts, which are exceedingly handsome, nor can there be any more durable, and at the same time equally cheap; lately a pair of gate-posts cost only a guinea. "This granite," says Mr. Tighe, "cannot be seen any where to better advantage than in the porch erected by Mr. Power, at Kilfane, which consists of four pillars, each a single block surmounted by a frize; in the execution of it the delicate mouldings are as well expressed as they could have been in any other stone.

CLIMATE.

The accounts given by the ancients of the climate of Ireland, appear in some respects contradictory. We are told by Cæsar, that the climate of Britain was milder than that of Gaul; and as Tacitus makes the climate of Ireland nearly the same as that of Britain, it may thence be inferred, that the temperature of the air in Ireland was also milder than in Gaul. Claudian applies to it the epithet of icy, a character which it certainly does not deserve at present. Strabo, who seems to have been very little acquainted with Ireland, considers it as a country scarcely habitable, on account of the cold; but according to Æthicus it enjoyed a climate superior to that of Britain. Mela describes the climate of Ireland as unfavourable to the ripening of grain, but says, that it produced such luxuriant crops of grass, that if cattle were suffered to feed long upon it, they would be in danger of bursting. Solinus states, that the country abounded with pastures, and he makes the same observation in regard to the cattle.

The venerable Bede, who flourished towards the end of the seventh century, says, that "Ireland is pleasantly situated, that it abounds with honey, and that it is not destitute of vines. Cambrensis, who was twice in Ireland, and who, about the end of the twelfth century, collected materials for a topography of the island, declares that nature has looked with a more favourable eye than usual on this land of the zephyrs. At the same time he asserts, that the climate is wet and windy, and represents the south-west wind as the most violent." "This seeming contradiction," says Dr. Patterson, "may be reconciled, by observing, that the frequency of our showers and fresh breezes, gives an appearance of wetness and ventosity, whilst the mild temperature of our air softens the impressions of the rain and wind on the feelings, and entitles the climate to the genial character bestowed on it in the above general inference drawn by Cambrensis."

Stanyhurst, in the preface of his Irish Chronicle, observes, that few countries are comparable, none preferable, to Ireland, in wholesomeness of air, fertility of land, abundance of corn, extent of pasturage, and number of cattle. Boate, who quotes these authorities, corroborates the account they give, and contends that there is no impediment, but the want of culture, to prevent Ireland from being justly counted among the most fruitful countries in the world.

At Dublin, in 1803, the greatest height of the barometer, June and September, 30·77; least, October, 29·80; mean of year, 30·64.

Greatest height of the thermometer, July, 79·50; least, December, 22; mean of the year, 49·16.

Greatest quantity of rain fell, November, 5·926320 inches. Total of the year, 29·67748 inches; days of rain, 193, on 17 of which snow fell. Storms in the year, 17.

At Dublin, in 1804, the greatest height of the bar. Feb. 30·87; least, Jan. 28·86; mean of the year, 30·567.

Greatest

Greatest height of the thermometer, Sept. 75; least, Dec. 31; mean of the year, 49·916.

Greatest quantity of rain fell, March, 4·218204 inches. Total of the year, 30·053722 inches; days of rain, 231. Storms in the year, 23.

The cold weather commences rather early, that is, in the beginning of October, and sometimes in the middle or latter end of September, and for the most part continues five or six months, till the middle or latter end of March, and sometimes throughout a considerable part of April. During this period, persons sensible to cold, and accustomed to a sedentary life, can seldom remain long without a fire.

On the other hand, the cold is rarely violent, or so intense as to produce congelation. There are generally three or four frosts every winter, but they seldom continue more than two or three days at a time. There have been a few winters that frost has lasted ten or twelve days, so that the Liffey, and other rivers, were covered with ice, capable of supporting men and animals, but these are extraordinary instances, which scarcely occur in the course of ten or twelve years.

If the cold be moderate in winter, so is the heat in summer; so that even in the hottest season, people are never incommoded by it. In the summer months, the weather, on the contrary, is more inclined to cold than to heat, and even so much, that a fire is often desirable.

In the spring, fair weather, with constant sunshine, generally prevails about the month of March, for five or six weeks; but afterwards the weather becomes rainy during the whole summer, so that there are scarcely two or three dry days in succession. In the latter end of autumn, the weather is again fair, and continues so for some weeks, as in the spring, but no longer. It is commonly observed in Ireland, that it rains more in the day than the night, and that when it rains two or three days, following each other, the intervening nights are entirely fair and serene.

In Ireland, very dry summers are uncommon, and even when they take place, they are not attended with any bad consequences, as it is a common saying, that the driest summers there never hurt the land. Corn and grass, which grow on arid and elevated ground, may, indeed, sustain some little injury from the drought, but the country in general is benefited by it. When a dearth happens in Ireland, it is not occasioned by immoderate heat, but generally through excess of rain.

Fogs and mists are not more common there in the plains, than in any other country. The mountains, however, are frequently covered with them to a great extent for several hours at a time, even when none are to be seen in the adjacent low districts; and it sometimes happens, that the top of a mountain is enveloped in fog, when the sides and lower part of it enjoy clear sunshine. There are even instances of the middle parts of a mountain being shrouded, while the summit and lower regions are quite open and uncovered. This is the case sometimes with the high mountains between Dundalk and Carlingford, not only in summer, but at other times of the year.

There are two kinds of mist or fog in Ireland, one of which is constant and uniform, filling the whole air in such a manner as to impede the view, and continuing in the same state till it vanishes, either by rising into the atmosphere, or falling to the earth. This kind is commonly followed by rain.

The other consists of clouds of foggy vapours, scattered about, with clear spaces between them. These clouds are often strongly agitated, and sometimes driven about with great velocity. This species of fog arises, not only on the sea-coast, but also in the interior of the country upon mountains, and often terminates in one general mist.

Ireland is not much exposed to snow, and some years there is none at all, especially in the level countries. In the mountains it is generally more abundant. In consequence of the winters being so open, cattle of every kind remain there out of doors during the whole season, without much inconvenience: yet there are instances, such as that of the year 1635, when there was a great fall of snow about the end of January, or the beginning of February, that the people have found it very difficult to bring their cattle in safety to their folds, or to a place of shelter.

Thunder and lightning are not more common than in other countries, and there are even some years in which they have not occurred above once or twice in a summer. They are seldom violent, and rarely do hurt either to the inhabitants or to their animals.

SIGNS OF CHANGES OF WEATHER.

It is difficult to explain clearly, and with precision, how modifications in the atmosphere,

atmosphere, and vapours, and exhalations affect animals, and produce changes in their bodies, since we are not acquainted with the curious organization of their most delicate parts; but we can observe, and perceive the progress and general consequences of these phenomena, as well as of those by which they are produced.

The following are the common and familiar signs exhibited by animals which indicate changes of the weather, and which are not so much taken from the agricultural poet who first collected them, as from common observation.

1. When the bats remain longer than usual abroad from their holes, fly about in great numbers and to a greater distance than common, it is a sign that the following day will be warm and serene; but if they enter the houses, and send forth loud and repeated cries, rain may be expected to follow.

2. If the owl is heard to scream during bad weather, it announces that it will become fine.

3. The croaking of crows in the morning indicates fine weather.

4. When the raven croaks three or four times, extending his wings, and shaking the leaves, it is a sign of serene weather.

5. It is an indication of rain and stormy weather when ducks and geese fly backwards and forwards; when they plunge frequently into the water, or begin to send forth cries and to fly about.

6. If the bees do not remove to a great distance from their hives, it announces rain; if they return to their hives before the usual time, it may be concluded that the rain will soon fall.

7. If pigeons return slowly to the pigeon-house, it indicates that the succeeding day will be rainy.

8. It is a sign of rain or wind when the sparrows chirp a great deal and make a noise to each other to assemble.

9. When fowls and chickens roll in the sand more than usual, it announces rain; the case is the same when the cocks crow in the evening, or at uncommon hours.

10. Peacocks, which cry during the night, have a presensation of pain.

11. It is believed to be a sign of bad weather, when the swallows fly in such a manner as to brush the surface of the water, and to touch it frequently with their wings and breast.

12. The weather is about to become cloudy and to change for the worse, when the flies sting and become more troublesome than usual.

13. When the gnats collect themselves before the setting of the sun, and form a sort of vortex in the shape of a column, it announces fine weather.

14. When sea fowl and other aquatic birds retire to the shore or marshes, it indicates a change of weather and a sudden storm.

15. If the cranes fly exceedingly high, in silence and ranged in good order, it is a sign of approaching fine weather; but if they fly in disorder and immediately return with cries, it announces wind.

16. When the porpoises sport and take frequent leaps, the sea being tranquil and calm, it denotes that the wind will blow from that quarter from which they proceed.

17. If the frogs croak more than usual; if the toads issue from their holes in the evening in great numbers; if the earthworms come forth from the earth, and if the ants remove their eggs from the small hills; if the moles throw up the earth more than common; if the asses frequently shake and agitate their ears; if the hogs shake and spoil the stalks of corn; if the bats send forth cries and fly into the houses; if the dogs roll on the ground and scratch up the earth with their fore-feet; if the cows look towards the heavens and turn up their nostrils as if catching some smell; if the oxen lick their fore-feet; and if oxen and dogs lie on their right side, all these are signs which announce rain.

18. The case is the same when animals crowd together.

19. When goats and sheep are more obstinate and more desirous to crop their pastures, and seem to quit them with reluctance, and when the birds return slowly to their nests, rain may soon be expected.

OTHER SIGNS WHICH ANNOUNCE CHANGES.

1. If the flame of a lamp crackles or flares, it indicates rainy weather.

2. The case is the same when the soot detaches itself from the chimney and falls down.

3. It is a sign of rain when the soot collected around pots or kettles takes fire in the form of small points like grains of millet; because this phenomenon denotes that the air is cold and moist.

4. If the coals seems hotter than usual, or if the flame is more agitated, though the weather be calm at the time, it indicates wind.

5. When

5. When the flame burns steadily, and proceeds straight upwards, it is a sign of fine weather.

6. If the sound of bells is heard at a great distance, it is a sign of wind or of a change of weather.

7. The hollow sound of forests, the murmuring noise of the waves of the sea, their foaming, and green and black colour, announce a storm.

8. When the spiders' webs and the leaves of trees are agitated without any sensible wind, it is a sign of wind and perhaps rain; because it denotes that strong exhalations rise from the earth.

9. These signs are less equivocal when the dry leaves and chaff are agitated in a vortex, and raised into the air.

10. A frequent change of wind, accompanied with an agitation of the clouds, denotes a sudden storm.

11. A want, or too great a quantity of dew, being a mark of a strong evaporation, announces rain; the case is the same with thick, white, hoar frost, which is only dew congealed.

12. The winds which begin to blow in the day time, are much stronger, and endure longer than those which begin to blow in the night.

13. Whatever kind of weather takes place in the night, it is not in general of very long duration; and for the most part, wind is more uncommon in the night than in the day time. Fine weather in the night, with scattered clouds, does not last.

14. A Venetian proverb says, that a sudden storm from the north does not last three days.

15. The hoar frost, which is first occasioned by the east wind, indicates that the cold will continue a long time, as was the case in 1770.

16. If it thunders in the month of December, moderate and fine weather will probably follow.

17. If it thunders at intervals in the spring time before the trees have acquired leaves, cold weather is still to be expected.

18. If the wind does not change, the weather will remain the same.

In regard to the general qualities of the seasons and their influence, attention may be paid to the following signs:

If the earth and air abound with insects, worms, frogs, &c.; if the walnut-tree has more leaves than fruit; if there are large quantities of beans, fruit, and fish; if the spring and summer are too damp; if hoar frost, fogs, and dew, come on at times when they are not generally seen, the year will be barren: the opposite signs announce fertility and abundance.

Animals seems also to foresee and prognosticate fertility or barrenness. It is said, that when the birds flock together, quit the woods and islands, and retire to the fields, villages, and towns, it is a sign that the year will be barren.

A great quantity of snow in winter promises a fertile year; but abundant rains give reason to apprehend that the year will be barren. A winter, during which a great deal of rain and snow falls, announces a very warm summer. It is generally believed, but perhaps without foundation, that thunder and storms in winter prognosticate abundance. When the spring is rainy, it produces a plentiful crop of hay and of useless herbs; but at the same time a scarcity and dearth of grain. If it is warm, there will be much fruit; but they will be almost all spoiled. If it is cold and dry, there will be little fruit or grapes, and silk-worms will not thrive. If it is only dry, fruit will be scarce, but they will be good. In the last place, if it is cold, they will be late in coming to maturity. If the spring and summer are both damp, or even both dry, a scarcity of provisions is to be apprehended. If the summer is dry, diseases will prevail; but they will be more numerous if it is warm. If it is moderately cold, the corn will be late, and the season will occasion few diseases.

A fine autumn announces a winter, during which winds will predominate: if it is damp and rainy, it spoils the grapes, injures the sown fields, and threatens a dearth. If it be too cold or too warm, it produces many maladies. A long severity of the seasons, either by winds, drought, dampness, heat, or cold, becomes exceedingly destructive to plants and animals. In general there is a compensation for drought between one season and another. A damp spring or summer is commonly followed by a fine autumn. If the winter is rainy, the spring will be dry; and if the former be dry, the latter will be damp. When the autumn is fine, the spring will be rainy.

LANDED PROPERTY.

The state of landed property in Ireland, however, seems to have been very uncertain for a long series of years, and considerable changes were made in it by forfeitures, the consequence of various rebellions. In the reign of Elizabeth there were no less than three. By the attainder

attainder of John O'Neil and his associates, more than half of Ulster was vested in the queen, to be disposed of as might be deemed most expedient for the interest and security of her government; and after the rebellion excited by the Earl of Desmond, his immense estate was seized and appropriated to the same purpose. In consequence of the latter confiscation, lands were offered to settlers at the small rent of three-pence, and in some cases of two-pence per acre; and on these terms grants were obtained by Sir Walter Raleigh, Sir Christopher Hatton, and many other persons of distinction.

The income of estates in Ireland varies from the lowest value to £100,000 per annum. The titles to them are in general derived by grants from Henry VII. Queen Elizabeth, Cromwell, or King William III. A few, however, are held by original title to the soil, as is the case with that of Mr. Cavanagh, at Borris, in the county of Carlow; that of Mr. O'Hara, the member for the county of Sligo, and several in the province of Connaught; but frequent rebellions, as already seen, have occasioned many changes in the ownership of estates; and by various vicissitudes incidental to human affairs, they have been transferred from one hand to another through many generations.

It has been a common practice in Ireland to grant leases for ever, or for nine hundred and ninety-nine years, or renewable for lives on the payment of a certain fine; and by these means the fee of most extensive estates belongs to persons who at present receive very little head rent. The Earl of Ormond possesses the fee of a district, which, if properly managed, would produce at least an income of 500,000*l.* per annum. The Marquis of Lansdowne has sixty thousand acres in the county of Meath, which are let for ever at a very small rent. Property of this kind I at first considered as fee farm rents; but I found, on minuter inquiry, that the owners claim a right to every thing under the soil.

The management of estates, in a certain degree, depends on the settlements by which they are handed down from father to son; as they sometimes allow them to be let only under particular restrictions.

In Ireland, landlords never erect buildings on their property, or expend any thing in repairs, nor do leases in that country contain so many clauses as in England. The office of an agent is thus rendered very easy, for he has nothing to do but to receive his employer's rents twice a year, and to set out the turf-bog in lots in the spring. Six months credit is generally given on the rents, which is called "the hanging gale." This is one of the great levers of oppression by which the lower classes are kept in a kind of perpetual bondage; for as every family almost holds some portion of land, and owes half a year's rent, which a landlord can exact in a moment; this debt hangs over their heads like a load, and keeps them in a continual state of anxiety and terror. If the rent is not paid, the cattle are driven to the pound, and if suffered to remain there a certain number of days, they are sold. This I have frequently seen done after the occupying tenant had paid his rent to the middleman, who had failed to pay it to the head landlord. The numerous instances of distress occasioned by this severity, which every one who has resided any time in Ireland must have witnessed, are truly deplorable; and I believe them to be one of the chief causes of those frequent risings of the people, under various denominations, which at different times have disturbed the internal tranquillity of the country, and been attended with atrocities shocking to humanity, and disgraceful to the empire.

TENURES.

The general tenure by which land is held in Ireland, is derived from grants made by the crown on the payment of a certain quit rent, received by the excise collector of the district. Persons invested with estates in this manner, have frequently leased them for ever, or on lives renewable for ever, or the payment of a fine for the insertion of a new life, instead of that which has dropped. This, in fact, is the same thing under a different form, as a lease for nine hundred and ninety-nine years. Any intermediate term between that and sixty-one years is so rare, as not to be a subject worth consideration.

I place then the original possessors of landed estates, those to whom they were originally granted by the crown, and the lessee of land for ever, or for nine hundred and ninety-nine years, in the same class, considering them as having unlimited power and controul over the soil. The leases commonly granted appear to be as follows:

61 years and lives	21 years and lives
31 years and do.	21 years
31 years	

Of clauses. I am acquainted only with one,

one, which is enforced more in Connaught than in any other province of Ireland; but it is far from being general. It is that which binds tenants to work for their landlords at a given rate of wages. Some are frequently inserted, to oblige them to maintain and repair houses and buildings, of which, perhaps, there is not a stone or a stick remaining; and others, sometimes, to prevent occupiers from breaking up grass land at the expiration of their leases; but to these clauses very little attention is paid. Juries invariably set their faces against them; and as they are contrary to the habit and spirit of the country, the judges even are said to lean towards this common feeling.

AGENTS.

In regard to agents, care should be taken to select men, who not only have a knowledge of agriculture sufficient to enable them to manage the estate in such a manner as to be conducive to the interest of the landlord, but who possess sufficient justice and honesty to prevent them from having recourse to means which may injure or oppress the tenants. An agent, to ingratiate himself with his employer, will, no doubt, use every exertion to increase the rental of his estate; if this can be done without imposing too heavy burdens on those by whose labour this increase is produced, he will so far be worthy of commendation; but if he wishes to accomplish his end by contrary means, he not only injures the proprietor, by exposing him to an odium which he does not deserve, but lays the foundation of ruin to his property, and of misery and wretchedness to those who render it productive.

In my opinion, a resident agent is more exposed to the temptation of making exactions from the tenants, as is frequently the case, than one who occasionally visits the estate for the purpose of collecting the rents. The former often descends to the meanness of requiring from these poor people, fowls, geese, or turf, and sometimes the labour of men and cars to assist him in his harvest and turf seasons. Such paltry emoluments, demanded without right, yielded under the impression of fear, and accepted without shame, can be no object to an agent of character, and, in many cases, may subject those from whom they are extorted to considerable inconvenience. I have therefore, in general, found the non-resident agents, who were not under a similar temptation, by far the most respectable. It is proper that agents should be handsomely paid for their trouble; and there can be no objection to their receiving whatever their employer chooses to give them for their service, which is commonly five per cent. on the rent; but improper means of their adding to their emoluments ought to be reprobated, and landlords should use every means in their power to prevent them.

What I found most mischievous in the relationship of agent and proprietor is, that all intercourse between the latter and the tenant is impeded, except through a selfish medium; the agent, in numerous cases, being a creditor of the landlord, whom he therefore has completely under his power and controul. This evil, in Ireland, has been carried to the most criminal excess, so that it was found necessary to enact a law which renders all leases from a landlord to an agent invalid. Without a check of this kind, the most flagitious transactions would have been carried on with impunity, as a door was left open to assist the designs of villany, and facilitate, in an uncommon degree, unwarrantable transfers of property.

Many agents have sons, or other relations, settled as shopkeepers on some part of the estate to which they belong; and a tenant, unless he chooses to run the risk of incurring the displeasure of these harpies, cannot purchase a yard of tape, or a pound of cheese, in any other place. Nay, I have known agents, when they had no relations to provide for in this manner, dispose of a shop to a stranger, and exact from him a percentage on all his profits.

RURAL ECONOMY.

Large tracts of country, exclusively devoted to the breeding of cattle, as is the case in the Highlands of Scotland, are not to be found in Ireland; and even in places where this system of rural economy is pursued, they are so uncommon, that they appear to have been set apart for that purpose, rather by accident than design.

In most of the dairy districts, calves are reared, and frequently sold when yearlings, to persons who graze them till they are three or four years old. They are then resold to graziers, in order to be fattened; and in many instances where this method is not followed, the male calves are slaughtered at an early age, that perhaps of three or four days, and

and used at the table as veal. The cow-calves, however, are preserved and reared for the supply of the dairy.

A mixture of grazing and tillage is seldom adopted, except by gentlemen, and in this respect there is a wide difference between England and Ireland. In the eastern part of England in particular, there are many winter graziers whose farms are nearly all under the plough, but who fatten such numbers of cattle that the supply of the capital during April and May, depends in a great measure upon those which have been fed on turnips in Norfolk, Suffolk, and Essex. The mountains of Ireland, instead of being grazed by their owners or large occupiers, who in that case would annually sell their draught stock, are frequently let on a partnership lease to the inhabitants of a mountain village, each of whom turns out a fixed number of *collops*, according to his share of the tenure. These collops, for the most part, are cows, goats, or geese; and the only saleable produce of such districts, is butter. The want of roads in these mountains is a great impediment to tillage; grain could not be transported from one place to another without considerable expence; but butter is easily conveyed in panniers, or at any rate on sliding cars, a kind of vehicle without wheels, which is similar to our sledge. The word *collop* is applied to various objects; a horse is generally a collop; two cows are equal to a horse, and consequently comprehended under the same term; four yearling calves, or one cow and two yearling calves are a collop; five goats are equal to a cow, so that ten goats are also a collop, and I believe the case is the same with twice that number of geese. Sheep are rated with goats, but are by no means so frequent, for milk is the chief object, and an ewe does not yield nearly the same quantity as a she-goat, yet now and then sheep are kept also for this purpose. Some readers, perhaps, may be surprised to hear that sheep are kept on account of their milk, but this custom is not confined to Ireland; it is common in Carmarthenshire, and I have observed it in other parts of Great Britain.

The northern mountains of Ireland support a few cattle, but they are generally in a famished condition; and even in the south, where they are much more frequent, some perish through bad food. In the north, I have travelled during a whole day without seeing any other animals than goats, browzing in flocks as they do in Swisserland. The want of cultivation, at the bottom of these heights, to insure food in winter, and of proper attention to shades, will sufficiently account for this circumstance. On the coast of Clare I observed shades, consisting of stone walls, built in the form of a T, which were exceedingly well calculated to answer the purpose intended.

CATTLE.

The native Irish stock were, in my opinion, all black, for though at present there are very few of that colour, they are universally called "black cattle." I have seen some which were pointed out to me as the remains of the ancient breed; they were narrow in the loins, and thin in the quarters; they had short legs, large bellies, and white faces; their horns, which turned backwards, were remarkably wide set, and they had large dewlaps; but this breed is now almost extinct. About fifty years ago, but I am not able to state the exact period, the then Earls of Farnham and Altamont, imported some excellent long-horned stock from Staffordshire, being of the same breed which the celebrated Bakewell afterwards took so much pains to bring to perfection in England. Mr. Waller, of Allanstown, in the county of Meath, introduced cattle of the same kind nearly about the same period, and the shape and qualities of this long-horned species are now so completely transfused into the native Irish cattle, as to render their appearance almost the same as that of the pure blood. Of late years, great importations of this original stock have been made by many noblemen and gentlemen; and I entertain no doubt, though individually they may have been losers in consequence of the high prices which they paid in England, and the very heavy expence of bringing them over, that their exertions have proved of essential benefit to the public.

SHEEP-GRAZING.

I do not believe, unless it be in some gentleman's domain, that there is a single breeding flock of sheep in the province of Ulster. Whatever sheep are kept, are tethered together in couples; and so little mutton is used by the people as food, that there is no demand for it except at Belfast, Londonderry, and Newry, the whole population of which, deducting the lower orders and young children, cannot exceed fifty thousand persons.

persons. Of these, not above one-twentieth part can be consumers of mutton, and, therefore, as the supply necessary for two thousand five hundred people, most of whom have sheep of their own, must be very small, we may easily account for the want of flocks in the north.

SHEEP.

The native Irish sheep are of a small size, and have a great resemblance to the mountain sheep in South Wales, being covered with nearly as much hair as wool. They are thin in the fore-quarters, narrow in the loins, and exhibit the same activity as the Norfolk breed. Some of this species are still to be met with, and are purchased from the mountains by gentlemen for their own use. They are not bought till they have attained the age of three or four years, and when properly fed, they make delicious mutton; but the importation of English sheep has long ago altered the general breed, as has been the case in regard to the native Irish cattle. Whether this change was effected by admixture with the Tweed-side, or the Leicestershire sheep, cannot easily be determined, but it is certain that the English and Irish breeds were intermixed long before Bakewell's day; and considering the appearance of the Irish sheep at present, they seem to me to participate in the characters as to wool and carcass of the Romney-marsh species, though there can be none of these in Ireland.

HORSES.

That species of horse distinguished in England by the name of the draught-horse, is not found in Ireland, and for this a very good reason may be assigned. The minute division of tillage-land prevents the cultivator from keeping horses exclusively destined for the draught. His horse must carry him to market, draw his small car, and perform every other kind of labour necessary in his agricultural pursuits. In a word, he must, according to the common phrase, be a horse of all-work. Some attempts have been made to import the Leicestershire black horse and the Suffolk, and liberal premiums have been offered by the Farming Society, to induce the Irish to improve the breed of these useful animals, but with very little success.

There is one species of horse, a native hard-footed Irish hack, which I consider as a most useful animal. This breed are very much used by the linen merchants of Ulster, who ride from market to market to transact their business; these animals seldom exceed fifteen hands in height, but they are very hardy and sure footed.

A large long blood horse, which sells for a high price, is to be found in some of the rich grazing counties. This breed is much reared in Meath, but I observed individuals of it wherever bullocks were fattening.

In Roscommon, the horses have acquired a habit of jumping over walls, and in this they are so expert, as almost to exceed belief.

GOATS.

Flocks of these animals are kept in many of the mountainous districts, and by all the cotters throughout the whole country; but they are generally tethered together in every manner that cruelty can devise, to prevent them from straying into the grounds of their neighbours. They produce some milk, but the kids, which are not considered as any rarity, seldom bring the same price as lambs.

HOGS.

These animals are in such general request, that they are to be met with in every part of the kingdom. No house, I believe, is without one. They are kept to a considerable age, sometimes to that of two years, and are seldom fed upon corn. Potatoes is the common fare of the hog, as well as of the children, throughout Ireland; but this animal rarely comes to the table of its proprietor as it does in England, because, when fattened, it is sold for the purpose of paying the rent, and it is exported, either as salt-pork, hams, or bacon.

TILLAGE.

The arable land in Ireland is cultivated according to a system very different from that pursued in England; I shall endeavour to describe it; but I apprehend that many of my English readers, if they expect to hear of enlarged plans of farming, or improved modes of cultivation, worthy of the present enlightened state of science and the arts, will be greatly disappointed. In the chapter on property, it has been seen, that in consequence of the village partnership system, which prevails chiefly in the western districts of the country; the petty manufacturing farmers in the eastern parts of Ulster; the equally small sub-divisions throughout the greater part of the southern coast; the large tracts of mountain, or of rich grazing pastures,

pastures, in many of the counties, and in others, where these are not found, the land occupied by dairies, that little room is left for tillage farmers. There are indeed some small ones in the southern baronies of Wexford, a county which is divided into rather larger farms than are usual in Ireland; but the principal part of the land appropriated to tillage, is found on crossing the river Barrow to Kilkenny, and pursuing a line of country through Kildare and some parts of Meath and of Louth.

POTATOES.

It is rather extraordinary, notwithstanding the great use made of potatoes and their general cultivation, that considerable difference of opinion prevails in regard to the nature of this valuable root, and the country from which it was brought. Some have called it the *sisarum peruvianum*, but the Linnean name by which it is known at present is *solanum tuberosum*. A Danish author says, that it was brought to Europe in 1586, by Sir Francis Drake, who gave it to the botanist Gerrard; the latter planted it in the neighbourhood of London, and sent some sets to Clusius in Holland, whence it was afterwards spread throughout all Europe. Another Danish writer, Professor Begtrup, asserts, that it was brought in 1565 from Santa Fé in New Spain, by Captain John Hawkins. But, however this may be, it appears probable that it was introduced into Ireland by Sir Walter Raleigh, and planted in the gardens near Youghal, where Sir Walter had an estate. But no proper instructions seem to have been given to the person by whom it was cultivated, for when it grew up pretty high, he attempted to eat the apple, which he took to be the fruit of the plant; finding it unpleasant he thought his labour lost, and paid it no farther attention; but digging up the earth some time after, he found the roots spread to a great distance, and from these the whole country was gradually supplied.

There is reason to believe that potatoes were generally cultivated in Ireland before they were introduced into England,* and even here they were long known before they became common. Some kind of authority even seems to have been necessary to bring them into general use; for we are told that at a meeting of the Royal Society on the 18th of March, 1663, a letter was read from Mr. Buckland, a gentleman of Somersetshire, recommending the culture of potatoes in all parts of the kingdom to prevent a famine. This was referred to a committee, and in consequence of their report, Mr. Buckland received the thanks of the society; such members as had lands were entreated to plant them, and Mr. Evelyn was desired to mention the proposal at the end of his Sylva.

Potatoes, like oats, are to be met with in every part of Ireland, and in many places where the latter are not sown; but they vary as much in quality as in quantity; the former depending as well on the soil as on the manure, seed, and climate. It is to be observed also, that they differ in weight, weighing much more when first taken up than at a later period of the season; but the most striking features in the cultivation of this sort are: 1st. that they exhaust all the manure of the farm; 2d. that they are never produced without manure, or are planted upon lea or maiden land, which is most frequently burned.

HIDING MONEY.

In Ireland, if from any accidental circumstance, the farmer makes money, he never thinks of employing it to improve the condition of his land. He buries his guineas in the earth, consoles himself with the idea of his secret treasure, and toils on according to his former routine. This is a striking fact; it speaks a great deal, and deserves particular attention. It not only shews a want of confidence, but betrays ignorance. It furnishes a most convincing proof how much men may be mistaken in regard to that grand source of action, interest. It is interest, the hope of immediate gain, which induces this poor farmer to exhaust the soil; and it might be supposed that the same motive would

* Dr. Campbell says, they were introduced into Ireland in 1610, and did not reach Cantire, in Scotland, till about a century and a half after, which, considering the vicinity of that province to Ireland, is rather singular; they came first from Ireland into Lancashire, where they are still very much cultivated. It was, however, forty years before they were generally planted about London, and they were considered as rarities, without any conception of the utility that might arise from bringing them into common use; at this time they were distinguished from Spanish by the name of Virginia potatoes, or *battatas*, which is the Indian name of the Spanish sort; the Indians in Virginia called them *openank*.

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make him apply the surplus to improve his land, that it might become more productive: but this is an idea which never enters his head. He may be compared, therefore, to a spendthrift who lives on his capital; by wasting a part of it every year, it becomes continually less and less, till at length it entirely vanishes.

The evil of hiding money is, however, the child of latter times. Mr. Young, whose acute observation suffered nothing to escape his notice, neither saw nor heard an instance of it when he was in Ireland: at present, it is common. I was told of it wherever I went; and, very often, on inquiring of a farmer concerning his system and produce, he would conclude his answer by saying, "and I buried some guineas." A similar practice has of late years been adopted in Holland; ducats and louis-d'ors have been buried there by the farmers in abundance. Men, who are secretly plotting against a government, or who are waiting in silence to take advantage of any disturbance that may arise, conceal as much as they can their rebellious intentions; but a fact of this sort betrays their feelings, it shews discontent, and affords a most decisive proof that they look forward to some change, and that they have no confidence in the existing state of things.

LIBERTY.

"The advance," says Mr. Young, "which the agriculture of England has made, is owing primarily to the excellence of our constitution; to that general liberty which is diffused among all ranks of the people, and which ensures the legal possessions of every man from the hand of violence and power. This is the original and animating soul that enlivens the husbandry of Britain." Whatever may be the case at present, I will boldly assert, that this, for many years past, has not been the situation of Ireland. I shall, perhaps, be asked, Have not the two countries had nearly the same constitution? This I am ready to admit; but unfortunately, the majority of the people in Ireland profess a religion, on account of which they have been excluded from the enjoyment of many of the blessings derived by others from that excellent constitution. I shall not enter into any discussion, whether the tenets of their faith are of such a nature, as to render it necessary to prevent them from participating in these blessings; it is sufficient for me to mention the fact, let it have arisen from whatever cause it may, as one reason to account for the miserable cultivation of the greater part of Ireland. It is not long ago, that a protestant brother was allowed to take possession of the estate of his elder brother, if a catholic. While the premises of a farmer were threatened with the possibility of such an event, was it to be expected that he could enter with spirit into the business of agriculture, or conduct it, either with benefit to himself, or advantage to the public? Besides, if a Roman catholic made any money, he could not invest it at home; and as catholics were prevented from voting at elections, protestants who possessed votes were certain, if they chose it, of obtaining their farms as soon as their leases were expired. Impose the same restrictions on the majority of the English farmers, and, notwithstanding the firm establishment of that enlightened system of British cultivation, which has brought the land in England to so great perfection, the island would soon be converted into a desert. Laws containing such restrictions have existed in Ireland, and are sufficient, independently of any other cause, to account for that wretched and ruinous mode of agriculture which is still pursued. To transcribe or refer to more of this odious code is needless. It will, perhaps, be said, that it is no longer in force: I know it; but the invariable answer to all my inquiries has been, that protestants are the best farmers; and that they enjoy a greater share of comforts than the catholics. All this proves to me, that there is a principle in human nature which revolts at restraint; that restraint of any kind, when not rendered necessary by the circumstances of the times, has a direct tendency to discourage exertion, and to damp that ardour of pursuit which characterizes the independent mind. Hence, the superiority of the protestant in this respect, inspires him with a confidence, which induces him to employ more industry, because he feels that he stands on a perfect equality with every one around him. Can the man who considers himself degraded make the same exertions as he, who, conscious of his own dignity as a member of society, sees no obstacles thrown in his way, to prevent him from obtaining a full recompense for his labours: or, is it to be expected, that he who is excluded from an equal participation in the rights of citizenship,

should

should display the same zeal and activity, as he that enjoys civil existence, unconfined by any fetters, either of a political or a religious nature? Interested politicians may assert what they please; but I will boldly maintain, that, if disqualifying acts hang over the heads of any class of men, unless they are mere slaves, lost to every sense of their own importance, they must feel themselves dispirited; and if so, they will be incapable of keeping pace in improvement with their more independent neighbours.

CANALS.

The Grand Canal runs from Dublin to Shannon Harbour, while another branch proceeds to Athy, where it joins the Barrow. This canal is more used for passage-boats, than for the conveyance of merchandise: it serves, however, for the carriage of corn and turf.

The Royal Canal, one branch of which commences at Glassmanogue, in the county of Dublin, and the other at the Liffey, near the Lots, extends to Coolnahay, beyond Mullingar; the two branches uniting near Prospect, on the Glassnevin road. It is used for the same purposes as the Grand Canal; and as these are the only canals which serve for the conveyance of passengers, it is proper to remark, that the boats are conducted with a punctuality and dispatch highly creditable to the companies to whom they belong. I travelled by these water conveyances, to ascertain how they were conducted, and found that I arrived at the place of destination nearly within a minute of the stated time. Good hotels, with every accommodation for travellers, have been erected by the companies at the places where the boats are accustomed to stop.

A canal has been cut from Coal Island to Armagh, and from that inland sea near Portadown to Newry. A freight of 4s. per ton is charged for this navigation, but there is little trade in the neighbourhood, and when I was there in 1809, it was nearly choked up with weeds.

An attempt has been made to cut a canal from Lough Neagh to Belfast, and though it is pretty far advanced, every thing is now at a stand.

In like manner, there is an unfinished canal between Ballyshannon and Beleck, which was stopped for want of sufficient funds; and at present all merchandise is conveyed by land carriage to the latter, and there shipped across Lough Erne to Enniskillen and other places.

ROADS.

I now proceed to the roads in Ireland, which are works of much utility, and justly celebrated for the excellence of their construction. There are no by-roads, and all the high-ways are of two widths, a mail coach way being broader than the others. As the sub-stratum of the greater part of the country is limestone, these roads are formed of that material broken into small fragments. Formerly, they were cut in lines "as straight as a gun-barrel" over hill and dale; but time has effected an improvement in the laying out of roads, as well as in other things, and new roads proceed now along the base of a hill. Some sagacious Irishman discovered that the segment of a circle is not larger when it winds round a hill, than when it extends over its summit. Places are often found, where the old-fashioned paved roads are still in existence. I remember them to have been twenty years ago very general in some counties, but at present they are confined nearly to those of Kilkenny, Kerry, and Wexford, where the roads are the worst in Ireland.

The making or repairing of roads in this country is effected in the following manner: any person who wishes to have a new road constructed, presents a memorial to the Grand Jury at the assizes, with an affidavit of its necessity. A deliberation then takes place upon the subject, and if the jury allow the presentment, the road is either made or repaired, as the case requires; the accounting presentment is sworn to, and must receive the sanction of the judge. The "undertaker," or maker of the road, afterwards procures an order from the Grand Jury to receive the money from the treasurer of the county. In the mean time it is liable to be traversed by any landholder in the barony, on his giving the parish twenty-one days' notice of his intention to oppose it at the assizes.

LINEN MANUFACTURE.

The foundation of the linen manufacture in Ireland was laid by the unfortunate Earl of Strafford, during the time he resided in that country as chief governor. Having observed that the soil, in many parts, was suited to the production of flax, that the women were chiefly bred to spinning, and that the price of labour was cheap, he conceived that

that linen might be made there at such an expense as would enable the manufacturers to undersell, twenty per cent. at least, those of Holland and France. Impressed with this idea, he sent to Holland for flax-seed, and to the Netherlands and France for competent workmen. The flax was sown, and succeeded according to expectation; spinners and looms were set to work; and his lordship, to animate others, embarked himself in the business, and expended, in promoting it, 30,000l. of his private fortune.

The preparation of the flax plant, and the various operations it undergoes before it is made into cloth, gives employment to so many people in Ireland, and brings into the national coffers so large an annual income, that the linen which is formed from it has, with great propriety, been called the staple manufacture of the country.

Yarn spun by the hand is carried to different degrees of fineness, in different parts of the country, according to the nature of the manufactories which have been established there, and the quality of the flax they produce: but in this respect, female labour has certainly the advantage over machinery, as the yarn produced by the former may attain to a degree of fineness which cannot be given to it by the latter. Some instances of the ingenuity of the Irish women in spinning are extraordinary.

There are many parts of Ireland where the manufacture extends no farther than to spinning, markets being held in these places for yarn only. The quality of the linen depends upon the fineness of the yarn, and on that account the finest is manufactured in those parts where the finest yarn is spun. In many instances, the flax is raised, spun into yarn, and woven into cloth, by the same person and his family. Taking Ireland, however, in general, the cultivators of flax are much more numerous than the spinners, as is shewn by the exportation of unspun yarn; and the spinners out-number the weavers, as appears by the same list, in the exportation of linen-yarn. Linen is woven of different widths, from ten-inch bandle linen made in Kerry, to 5-4 sheetings manufactured in the neighbourhood of Coote-hill, and of different qualities, from coarse thin 3-4 wides in Antrim, which sell for sixpence per yard, to cambrics worth one guinea.

It may be difficult to assign a reason why the manufacturing of linens of certain widths is confined to particular districts. Narrow linens, not exceeding, when bleached, 32 inches, are made in Donegal, Londonderry, Tyrone, and Antrim, and in the latter, all the 3-4 wide linens are manufactured. In the neighbourhood of Belfast, Lisburn, and Lurgan, the fine yard-wide, or cambrics, lawns, and diapers, are made; and in Armagh, coarser yard wide cloths, and some 7-8. Near Coote-hill the 5-4 sheetings are wove. Cavan produces a thin linen, for the most part 7-8 wide. Fermanagh and Sligo manufacture 7-8; and in these counties are found most of the bleach-greens, which finish for sale those linens that are sent in a bleached state to England. A strong kind of 7-8 dowlas, some 9-8 and 5-4 sheetings, made in the counties of Louth, Meath, and Dublin, are sold in the market of Drogheda, and find their way, in an unfinished state, into the country markets of England. A coarse cloth, very much like Scots Osnaburgs, is manufactured in Kerry and Cork, and is used, in the same manner as the Osnaburgs, for negro clothing.

The bleachers are distinct persons from the manufacturers. The latter carry their webs to market, where they are purchased by the former, in order to be finished. In that state they are sold generally through the medium of factors in Dublin or London, who supply capital, that credit may be given to the purchaser. In Dublin they allow two months' credit, and in London eight.

The linens exported are of a thinner texture than those used in England, and the country trade requires a stouter sort than those sold in London. In England, great suspicions are entertained in regard to the arts practised by the bleachers in Ireland, and on that account, large quantities of linen are imported, either in a brown, or a half-bleached state; but even this precaution is not sufficient to obviate fraud, and prevent imposition. It is a melancholy truth, confirmed by daily experience, that mankind, not satisfied with the fair and honourable profit of trade, have recourse to the meanest and most dishonest arts to increase them. Ingenuity supplies its aid to support this system, and as it too often proves successful, the consequence is, the destruction of that confidence which ought to subsist between one man and another in commercial transactions. Ireland is not free from a share in this reproach. In that country, large

large quantities of grease, and sometimes potatoes reduced to pulp, are rubbed into the webs whilst weaving, to make them weigh heavier, and acquire a stouter feel to the hand. Even those who purchase cloth in the half-bleached state, are liable to this imposition; for the linen, without having been boiled or subjected to any preparation by machinery, is merely whitened with cold lime, but the buyers believe that its whiteness is owing to its having been purged in the yarn.

Cloth, purchased in an unfinished or half-finished state, is afterwards bleached in England, but it is not made up with starch or blue, or exposed to a beetling engine, according to the process adopted in Ireland. In the former country, bleaching is carried on to a very great extent. Mr. Reynolds, at Cashalton, near London, has an immense bleach-green, where more business is done than at any five in Ireland; and there is one equally large in the neighbourhood of Manchester.

Linens are bleached, not merely by the action of the air and of water, but by the application of chemical substances; and this branch of art has been carried to great perfection, in consequence of the valuable discoveries made by the chemists, both in this, and in other countries. With the nature and use of these substances, however, the generality of bleachers are but imperfectly acquainted; and the art is often left in the hands of ignorant workmen, who, without any knowledge of scientific principles, pursue a certain routine, which is merely the result of habit. The price of bleaching varies according to the finishing and width, but it seldom exceeds 4d. per yard.

Of the quantity sent out of the country, an account might be procured from the books of the custom-house; but this information, though important, would by no means be so valuable, as a return of the whole quantity manufactured could be obtained, if every seal master were obliged to transmit to the linen board the number of the webs, for the stamping of which he receives payment in the course of a year.

The quantity of linen sold in Dublin in 1809, will be seen by the following statement, taken from the Appendix to the linen board reports.

A return of linen inwards and outwards at the Linen Hall, for one year, ending 1st of March, 1809:

Packs and boxes.		*Average value.*
Inwards 10,227 .... 160, each		£1,636,320
Outwards 9,2[illegible]9 .... 170, each		1,738,590
Value remaining in the hall, on the 1st of March, 1808		408,615
From which, deduct linens sent from the hall in carts and bags, to merchants' warehouses, &c.	50,000	
More in value outwards than inwards	102,227	
		152,227
		256,388

The packs and boxes are averaged more this year than last, from the advance on linen, and the packs and boxes outwards contain more linen than inwards.

On considering the manner in which the linen trade is conducted, it would appear that there is something very singular in the Irish character; and one is almost inclined to believe, that it is deficient in energy, a feature so conspicuous in that of many other nations. The people of Ireland seem incapable of calling forth their own powers of exertion, unless when stimulated by adventitious assistance. A spinner, to become industrious, must be presented with a wheel; a weaver, before he will work, must be supplied with a loom; and a bleacher cannot carry on business, unless he be furnished with a house in Dublin for the purpose of selling his commodity. Even a gentleman will not plant for his own advantage, or amusement, until he be impelled by some extraordinary inducement. By the sums lavished for the general encouragement of the linen manufacture, one might be led to conclude, that it is the policy of the legislature to extend it over the whole island; a circumstance which, if carried into effect, would, in my opinion, be as great an evil as could possibly be imagined.

MANUFACTURES IN GENERAL.

Taking a general view of the manufactures of Ireland, it may be estimated that, except in the eastern part of the province of Ulster, the domestic manufacture of woollen goods is every where prevalent, without that due division of labour which can render it of any benefit to the country.

The linen manufacture flourishes most in Ulster, but it is established also in Galway, Mayo, and Sligo, and towards the south in the whole neighbourhood of Drogheda; it is found also in the King's County, Kerry, and along the coast of Cork;

Cork, in a word, it may be said, in some measure, to extend to every part of Ireland, except Wexford and Wicklow, where it is almost unknown. In every other district there is the same domestic manufacture of linen as of woollen, for most families raise flax, and prepare from it all those articles which are necessary for their own comfort and use.

The cotton manufacture seems to be established chiefly at Belfast; but it has spread to Dublin, Kildare, and even to Wicklow and Wexford manufactories; having been formed at Stratford and Enniscorthy; I know of none, however, to the west, or farther south, than these places.

Broad cloth and blanket manufactories are established no where north of Dublin, flannels are made in Wicklow, blankets in Kilkenny, and broad cloths at Middleton and Cork.

In the neighbourhood of Cork, and along the coast of that county, stuffs are manufactured, and the spinning of wool into yarn is much followed by the women in the north-west parts of the island. In the same districts, illicit distillation gives employment to a great number of people, the legal distilleries being chiefly in the south.

The salting of provisions is confined almost to a line south of Dublin. Mills, for the grinding of wheat, have not yet been erected in Cavan, Fermanagh, Tyrone, Donegal, Sligo, Leitrim, Mayo, Roscommon, or Galway; but mills for grinding oats are common.

A

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IN THE YEARS

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MADEIRA BECOME ENGLISH.

THIS island has latterly been much frequented by invalids from Great Britain, suffering under pulmonary and other complaints, much benefit having been derived from the influence of the climate. The seasons are only two, summer and winter; there is no degree of heat and cold in the extreme; and there is an infinite change for the better in the society of the island, as every class of visitors may find a circle suited to their respective conditions. Mantua-makers, milliners, &c. have gone over in good abundance, and English fashions have partly supplanted the Portuguese bad taste. Scarcely a week passes but some vessel from Europe touches at the island, and thus gives an opportunity of communicating fresh intelligence on subjects in which these islanders feel great interest.

There is now an opera, and they have subscription balls once a fortnight, and sometimes oftener, to which the people of fashion and merchants resort; and those who before but knew each other slightly, are becoming more familiarized to one another. There are likewise accommodations for convalescents: and as the salutary effect of the climate becomes more known, and the resort of visitors more frequent, the calls of wealth will naturally attract the usual supply; and those who can pay for every thing, will soon here, as in the English watering places, want for nothing. I would advise, however, that an English visitant should not expect too much from Portuguese civilization. He would do well, therefore, to take the best part of his kitchen with him, and even such of his furniture as is portable.

This island is strong by nature, and respectably fortified; and an enemy would find it difficult to effect a landing, owing to a heavy surf, which is perpetually beating on the beach. Even in moderate weather those who land are carried on shore on men's shoulders. At present twelve companies of the royal veteran battalion, under the command of an English general, form the garrison, according to stipulations entered into between the British and Portuguese governments; added to this, in cases of emergency, there is a force of between two and three thousand militia.

The government of the island, as heretofore, is conducted according to former usages, by a Portuguese governor, and magistracy acting under him.

TRANSFER OF THE PORTUGUESE GOVERNMENT.

The arrival of the Prince Regent in Brazil was hailed as the sure omen, and, as it were, the birth of its greatness and independence. The misfortunes of Portugal were totally immersed in what was gained to the Brazilians. They almost blessed that loss of the mother-country, which gave them the undivided care and possession of the royal family and government. Their voyage, before their arrival, was the subject of the constant prayers of their people, and nothing could exceed the joy with which they were received.

At Bahia the inhabitants testified the overflowings of their hearts by proposing to raise by subscription a sum of money equal to half a million sterling for building a palace.

Ever since this very memorable and interesting event, every facility and indulgence has been given to British shipping and British subjects touching at any of the ports of Brazil, who are now placed nearly upon a level with the Portuguese. The great grievance under the former state of things was, the vexatious arrests upon suspicion, or slightest deviations from port-regulation; the exorbitantly high duties, amounting to almost a prohibition of intercourse; the arbitrary and irritating searches, &c. but all this is now done away with, and the ports of Brazil nearly as free to England as those of England are to the Portuguese. That produce of the country is only excepted, which, by their own internal laws, belongs to the crown, such as gold dust, diamonds, salt, tobacco, Brazil wood, &c. in all of which the crown either has a monopoly, or such heavy duties as render it, in fact, a partner with the actual proprietor.

BARRINGTON.

The celebrated George Barrington held the office of high constable of Paramatta for many years, and in the faithful and vigorous discharge of his duty acquitted himself much to the satisfaction of the government. But he was now a mere living skeleton; he was emaciated, and apparently in the last stage of human life. Having absolutely lost the use of his intellectual faculties, he had retired on a small pension allowed him for former services, a melancholy instance of abused talents, and the force of remorse, and conscious sensibility, operating on a mind capable of better things. This extraordinary character finished his course on the 28th of December, 1804.

ABORIGINALS OF NEW HOLLAND.

These aboriginal inhabitants of this distant region are indeed beyond comparison the most barbarous on the surface of the globe. The residence of Europeans has here been wholly ineffectual, the natives are still in the same state as at our first settlement. Every day are men and women to be seen in the streets of Sydney and Paramatta, naked as in the moment of their birth. In vain have the more humane of the officers of the colony endeavoured to improve their condition; they still persist in the enjoyment of their ease and liberty in their own way, and turn a deaf ear to any advice upon this subject.

Is this to be imputed to a greater portion of natural stupidity than usually falls to the lot even of savages? By no means: if an accurate observation, and a quick perception of the ridiculous, be admitted as a proof of natural talents, the natives of New South Wales are by no means deficient. Their mimmicking the oddities, dress, walk, gait, and looks, of all the Europeans whom they have seen, from the time of governor Phillips downwards, is so exact, as to be a kind of historic register of their several actions and characters. They are moreover great proficients in the language and Newgate slang of the convicts, and in case of any quarrel, are by no means unequal to them in the exchange of abuse.

But this is the sum total of their acquisitions from European intercourse. In every other respect they appear incapable of any improvement, or even change. They are still as unprotected as ever against the inclemencies of weather, and the

the vicissitudes of plenty and absolute famine, the natural attendants on a savage life. In their persons they are meagre to a proverb, their skins are scarified in every part, and their faces besmeared with shell-lime and red-gum, their hair is matted like a moss, and ornamented, as they call it, with sharks' teeth; and a piece of wood, like a skewer, is fixed in the cartilages of the nose. In a word, they compose altogether the most loathsome and disgusting tribe on the surface of the globe.

OBJECT OF WORSHIP.

It is one of the most singular traits amongst these savage nations, that their religion is not only tinctured with, but apparently altogether composed of, such ideas as the nature of man most powerfully abhors. Their idea of a God, is not that of a beneficent being, the common parent of nature, and the creator and protector of man: such is not the god of the SOCIETY ISLANDS. On the contrary, the being they worship is the being they fear, the being to whom they impute the destruction of their canoes, and the danger, the diseases, and deaths of their chiefs. Their diseases, and particularly those of their priests, are sacred, as being the immediate effects of the power they worship.

From this general character, that their deity is the offspring of their fears, may be induced the whole system of their mythology, and the attributes of their divinities. Hence it is, the idea of horror being connected with deformity, the representations of these gods are usually either wholly shapeless or frightful.

KING TAMAHAMA.

Soon after our arrival at Owhyhee, we received a visit from our countryman, Mr. Young, who had resided there for fourteen years past; from whom we had a confirmation of particulars respecting Tamahama, communicated to us at Whahoo, and of his erecting a royal residence at Mowie, and, above all, of his fixed determination to attempt the conquest of the two other islands, of Attowahie and Onehow.

His palace is built after the European style, of brick, and glazed windows, and defended by a battery of ten guns. He has European and American artificers about him of almost every description. Indeed his own subjects, from their intercourse with Europeans, have acquired a great knowledge of several of the mechanical arts, and have thus enabled him to increase his navy, a very favourite object with him. I have no doubt that in a very few years he will erect amongst these islands a power very far from despicable.

The circumstances of this enterprising chief were greatly changed since the visit of Capt. Vancouvre, to whom, as to the servant and representative of the king of Great Britain, with much formality and ceremony, he had made a conveyance of the sovereignty of Owhyhee, in the hopes of being thus more strongly confirmed in his authority, and supplied with the means of resisting his enemies.

His dominion seems now to be completely established. He is not only a great warrior and politician, but a very acute trader, and a match for any European in driving a bargain. He is well acquainted with the different weights and measures, and the value which all articles ought to bear in exchange with each other; and is ever ready to take advantage of the necessities of those who apply to him or his people for supplies.

His subjects have already made considerable progress in civilization; but are held in the most abject submission, as Tamahama is inflexible in punishing all offences which seem to counteract his supreme command.

It was only in 1794 that Captain Vancouvre laid down the keel of Tamahama's first vessel, or rather craft; but so assiduously has he applied himself to effect his grand and favourite object, the establishment of a naval force, that at the period of our arrival he had upwards of twenty vessels of different sizes, from twenty-five to seventy tons; some of them were even copper-bottomed.

He was, however, at this time much in want of naval stores; and, to have his navy quickly placed on a respectable footing, would pay well for them. He has also between two and three hundred body-guards to attend him, independently of the number of chiefs who are required to accompany him on all his journies and expeditions.

In viewing this man, my imagination suggested to me, that I beheld, in its first progress, one of those extraordinary natures which, under other circumstances of fortune and situation, would have ripened into the future hero, and caused the world to resound with his feats of glory. What other was Philip of Macedon, as pictured by the Grecian historians!—a man who overcame every disadvantage of slight resources and powerful rivals, and extended the narrow sovereignty of Macedon into the universal

monarchy of Greece, and the known world.

Tamahama's ardent desire to obtain a ship from Captain Vancouvre, was in all probability first excited by the suggestions of Young and his countryman Davis; but such was the effect of this undertaking, that Tamahama became immediately more sparing of his visits on board the Discovery, his time being now chiefly employed in attending to the carpenters at work on this new man of war, which, when finished, was named the Britannia. This was the beginning of Tamahama's navy; and, from his own observations, with the assistance of Messrs. Young, Davis, &c. he has laboured inflexibly in improving his marine force, which he has now brought to a respectable state; securing to him not only a decided superiority over the frail canoes of his neighbours, but the means of transporting his warriors to distant parts. Some of his vessels are employed as transports in carrying provisions from one island to another, to supply his warriors; whilst the largest are used as men of war, and are occasionally mounted with a few light guns. No one better understands his interest than this ambitious chief; no one better knows how to improve an original idea. The favours of Vancouvre, and his other European benefactors, would have been thrown away on any other savage; but Tamahama possesses a genius above his situation.

His body-guards, who may be considered in some respects as regularly disciplined troops, go on duty not unfrequently with the drum and fife, and relieve each other as in Europe, calling out, "all is well," at every half hour, as on board of ship. Their uniform at this time was simply a blue great coat with yellow facings.

FOREIGN TRADE OF THE SANDWICH ISLANDS.

The Sandwich islanders, in the territories of Tamahama, frequently make voyages to the north-west coast of America, and thereby acquire sufficient property to make themselves easy and comfortable, as well as respectable, among their countrymen; to whom, on their return home, they are fond of describing, with great emphasis and extravagance, the singular events of their voyage. Several of them have made considerable progress in the English language; their intercourse with the Anglo-Americans, and the navigators from Britain, having given them the opportunity, of which they have so eagerly availed themselves.

Such is the astonishing assiduity of these people, and such their eagerness to improve their condition, by imitating the callings of the Europeans, that it is not unusual to see some of them exercising the trade of a country blacksmith, having for an anvil a pig of iron kentlage, obtained from some ship; a pair of goatskin bellows, made by himself or some of his countrymen; and his charcoal fire; making articles suited to the wants of his countrymen, or repairing and mending such as stand in need of it, with an ingenuity surpassing what might be expected under such circumstances.

The canoes of the Sandwich Islands far surpassed any that we had seen in other parts of the world; not only in solidity and strength, but in the neatness and skill of workmanship. These canoes are so well calculated for speed, that we have seen the natives work them along, with their short paddles, at the rate of eleven or twelve miles an hour, and fairly run them under water.

They are already well acquainted with the trade on the north-west coast of America; and from thence they may draw many articles to make up a cargo for their own country, or the neighbouring islands to the westward.

It may naturally be asked—What articles of commerce or barter can be possessed by the Sandwich islanders, a people just sprung from nature? The answer is at hand; they are able to furnish fire-arms, gunpowder, hardware, and cloth of different sorts; of all which Tamahama has accumulated more than is required for their own consumption.

These have been acquired in exchange for labour and refreshment supplied to the shipping who have touched there; particularly such as are engaged in the trade to the north-west parts of America. When the cargoes of these last are completed, they readily part with such articles as remain, at a very low rate, rather than be incumbered with them during the remainder of their voyage. Besides the above-mentioned articles of foreign introduction, the Sandwich islanders possess the *sandal wood*, pearl oyster shell, and some pearls, all articles of high value in the China market; but one difficulty still remains to their accomplishment of this object, which is the want of hands to navigate their ships on voyages of such length and intricacy. Fortunately, however, for

for these enterprising people, they have now resident among them several Europeans and Anglo-Americans, men of ability and knowledge; such as Mr. Young, Mr. Davis, Capt. Stewart, &c. &c. For twelve or fourteen years before our visit, these gentlemen had employed themselves successfully in instructing the natives, and their extraordinary chief Tamahama, in many useful arts, and particularly in that of navigation from island to island; so that many of the inhabitants have thus become brave, hardy, and not inexperienced, sailors.

NEW DISCOVERIES.

Not being conveniently situated, either in respect to time or means, for making new discoveries, or exploring unknown islands, we did not vary our course to gratify our curiosity; we concluded, however, that this island had never before been seen by any European, otherwise the inhabitants would have been more ready to court our acquaintance. The natives of such countries, as are unacquainted with Europeans, I have constantly found to be shy, reserved, and very suspicious. In compliment to the late Sheriff of London, Sir Richard Phillips, we named it Phillips's Island: it is situated in latitude 16° 24′ south, and longitude 143° 57′ west.* To another in its neighbourhood, situated in latitude 16° 10′ south, and longitude 143° 47′ west, we gave the name of Holt's Island. They, with the others, will be found accurately laid down in Mr. Arrowsmith's charts of the Pacific, a man who, from his incessant industry and perseverance in the science of geography, is far above any eulogium I can bestow; of this gentleman, it may be truly said, that he has exhibited with the greatest minuteness and accuracy, in his charts of the Pacific, and brought into existence, new islands in a new world.

EUROPEAN VICE.

The propensity which these people have to continual wars with each other, is of the most fatal consequence to the happiness of these islanders. Their minds have thus acquired a ferocity, which otherwise seems not natural to them.

DEATH OF POMARRE, THE OTOO OF COOK.

There were so many ceremonies to be performed at Attahooroo, that the business had not been finally settled when the ship arrived. The intelligence of this event, however, brought Pomarre home to prepare his presents; he had got his hogs in the canoe, and was half way to the ship, when he was seized suddenly with a fit, and, falling with his hands on the side of the canoe, expired. The poor fellows in the canoe immediately paddled back as fast as possible to his house at Oparree, where, on her way likewise to visit the ship, Edeah had by this time arrived. Messenger after messenger was dispatched to the missionaries and their surgeon; they were earnestly entreated to hasten to Oparree. The surgeon happened at this time to be on board the ship, taking a farewell leave of us upon our departure. We earnestly advised him, should he find Pomarre still alive, not to venture to prescribe for him; as in the case of his death the natives would not fail to impute it to poison, and perhaps avenge his supposed murder on the mission. It has been before mentioned, that they imputed the death of Tereinavouroa to the prayers of the missionaries; and that they are persuaded the prayers of these holy men have this kind of sacred witchcraft. Under such impressions it may readily be conceived that the situation of the missionaries is not the most pleasant in the world.

Not one moment was lost on the part of the surgeon, who, on his arrival, found the whole family in the deepest anguish and distress. Paitia, the brother of Pomarre, was deaf to all consolation, and could scarcely be withheld from suicide. All was anguish and confusion; some imputed his death to one cause, others to another; but the opinion of the majority was, that he had offended the gods, though they could not agree by what means, except by his human sacrifices. They had recourse to one most singular remedy; the body of a human victim which he had sacrificed about three weeks before, was brought and stretched prostrate under him, in the hopes of appeasing the offended divinity.

The sudden and instantaneous death of this man (the Otoo of Capt. Cook), was not very unreasonably imputed by some to the enormity of his crimes, as well

* The editor of the Monthly Magazine fervently hopes that he has merited this well-meant compliment of the worthy circumnavigator. Yet for any services rendered by him to humanity, in executing the duties of an important public office, he candidly confesses that he has received more distinction in the Pacific Ocean than in Britain; but "a prophet is not without honour save in his own country!"

well in this as in other instances. Should these impressions continue, the most beneficial effects may be expected. None had more cause of regret in this event than the missionaries, to whom Pomarre had ever continued a stedfast friend. They wrote to the captain of the ship, requesting him to remain till the morning, that the sense of the Society might be taken in what manner to act upon this unexpected occurrence. The captain thought he should lose nothing by compliance, aud therefore consented.

EUROPEAN CURSES.

The Otaheitans will doubtless rack their brains to discover some probable cause of the death of Pomarre; and, after other conjectures, will perhaps impute it to some magical power from the ship. Should any one amongst them make this assertion, I have no doubt that he would be immediately seconded by his countrymen, so general is their belief in supernatural agency.—On the decease of his son, about a month before, they were firmly persuaded that he had been charmed to death by the missionaries.—They are moreover convinced that the greater part of their plagues and diseases flow immediately from the shipping. They insist upon it that Capt. Cook brought the intermittent fever, the crooked backs, and the scrophula, which breaks out in their necks, breasts, groins, and arm-pits. That Vancouvre brought a bloody flux, which in a few months killed a great number of them, and then abated. They say that Capt. Bleigh also brought the scrophula; but I could not learn what ship introduced the elephantiasis and epilepsy! No doubt they are likewise said to be of European extraction, as well as the hump-backs, and some others.

DEPOPULATION OF OTAHEITE.

The missionaries had made the circuit of the island twice during the time we had been amongst them, preaching from district to district, and seconding their exhortations with presents. If zeal in the discharge of their duty could ensure success, they would not preach in vain.

In their circuits they have successfully endeavoured to come at the exact number of the people. It is melancholy to add, that the population has diminished in a degree which threatens to reduce the country to a desert. Capt. Cook computed them at upwards of two hundred thousand; the population has now dwindled to five thousand, but on the arrival of the Duff they exceeded triple this number. Mr. Elder and Mr. Wilson had just returned from the Mottos, whither they had been conveyed by our boat on the 18th of August. They reported that the population did not exceed three hundred.

The mortality which raged at this period, and which I fear is but too epidemic and frequent, was such as to inspire us with the most melancholy ideas. During our short absence in our visit to the Sandwich Islands, many young persons of both sexes were no more, they had died in the prime and vigour of life, and others of an appearance equally healthy were following them very fast. Great part of this mortality must be imputed to their ignorance; the doctrine of fatality prevails among them to a most dangerous excess. Every disease is the immediate consequence of the vengeance of their offended deities, and therefore every thought of remedy or relief is rejected as equally useless and impious. They are left to their fate; and their diseases are unfortunately such as, however easy of cure under a regular course, are but too fatal when suffered to augment under neglect.

They entertain the greatest contempt for old age; and if they disliked any of our articles, were accustomed to say, it was as worthless as an old man.

THE DIVINITY.

The missionaries tell them that the God of Britain is the God of Otaheite and the whole earth, and that it is from this being they receive their hogs, bread-fruit, and cocoa-nuts. This the Otaheiteans flatly deny; alleging, that they possessed all these articles long before they had heard of the God of Britain. The ignorance of these people in this respect is lamentable in the extreme. Though upon the first arrival of the missionaries the district of Matavia had been ceded to them, the natives still persist in considering them as there only *by sufferance.*

FIRE.

Through all the Society Islands they have invariably the same method of procuring fire; taking two pieces of wood, and making a groove in one for the other to traverse in, they rub them together till the friction produces smoke, and the smoke flame. A bundle of dry grass serves them for tinder.

INFANTICIDE.

It appears that a far greater number of females than males fall a victim to this national depravity. This may be imputed to two causes: in the first place,

it has been invariably so practised by their ancestors; and secondly, the greater difficulty and restrictions which are required in bringing up a female than a male. When reproaching Pomarre with this barbarous and inhuman practice, he alleged in reply, that should all the children born be reared to maturity, there would not be a sufficiency of food on the island for their support.

The Arreoys, or gentry, are a society so licentious and profligate, as to call loudly for punishment, even from the Divine power. The very principle of their union is the community of their women, and the murder, at the moment of their birth, of all their issue of both sexes. By a strange and most lamentable perversity of mind, these wretches are venerated as a superior order of beings, and are treated as such wherever they go. I am persuaded that the example of these murderers extends this horrible mischief beyond themselves; the common people of all countries usually judge, and in consequence act, more from the example of their superiors than as guided by their own reason. The Otaheitans may thus be led to imitate what they see in their Arreoys. I believe, throughout the whole island, it is a matter of choice, whether a child shall be brought up or murdered. This mischief is inconceivably great; their dissolute and abandoned principles spread like a pestilence; and, what renders it still worse, they rove from island to island, and every where disseminate the same poison. I find it difficult to speak of this abominable set without horror. Would it be credited by any one who received it on less authority than that of the testimony of one navigator, confirmed by a series of others in succession, that there existed on the surface of the globe a people who, deaf to the instinct of nature, and the clear reproach of even the brute creation, can thus murder a whole race of infants, and consign to death the little beings whom they have been instrumental in bringing into life!! I scarcely expect to be believed by an English mother, yet true it is, that an Arreoy mother is no sooner delivered of her child, than she in general murders it.

DESOLATION OF OTAHEITE.

To any man of humanity, nothing can be more distressing than to cast his eye on the island of Otaheite, a spot blessed by nature with every thing that can render life pleasing; fertility of soil, and serenity of climate; but now become a scene of general mortality, and a prey to disease, which to all human appearance, in a few years, must render it a desolate wilderness, untrodden by human feet.

They impute the greater part of these diseases to their European visitors, but for the most part very absurdly, though indeed we must take our share. There can be no doubt but that thousands of them have been swept off by the venereal disease since their intercourse with Europeans.

At the time of our leaving the islands many of these unfortunate objects were in a state truly pitiable, through this disorder, though the missionary surgeon, a gentleman of great humanity, spared no efforts to alleviate their misery. But it was a very difficult thing to persuade them to adhere to his prescriptions. They have a violent antipathy to medicines of all kinds, and, what is equally against them, they are no sooner taken with the disease, than they are deserted, and left to shift for themselves. In this helpless condition, their chance of recovery is small indeed. Whenever the missionaries speak to them respecting salvation, they fondly think that it is to be saved from sickness, and to abide in this world: the salvation of the soul they affect to despise, and the resurrection of the body they ridicule as extreme folly.

Besides the disorders above mentioned, they have many others with which I am unacquainted, but which doubtless have their share in the destruction of the population.

But the most effectual instrument of the annihilation of these people is the horrible practice already noticed, that of infant murder and human sacrifices. It is computed that at least two thirds of the births are thus stifled. In vain does nature raise her voice against what long usage and profligacy, confirmed by habit and example, has so barbarously induced. If the future diminution of these people keep pace with that of late years, and particularly during the time of my abode among them, the population must soon be extinct. The missionaries made the tour of the island twice during my residence, in each of which they numbered the people; and, according to their first calculation, they were seven thousand, but in the second they very little exceeded five.

This mortality cannot be too seriously, however uselessly, lamented. So blind are these poor wretches, that, incapable of comprehending that the true cause of this

this evil must be attributed to their own practices, still they scruple not to impute them all to their intercourse with Europeans.

TRAVELS IN SWEDEN,

DURING

The AUTUMN of 1812.

By T. THOMSON, M.D. F.R.S. L.&E. F.L.S. *Member of the Geological Society, &c. &c.*

Quarto, 2l. 2s. boards.

[At the present moment Sweden stands prominently before the world, either from its unexpected interposition between the great belligerents, or from its suiting the policy of some of them to swell that interposition into undue importance. The publication, therefore, of Dr. Thomson's Account of his Excursion through that kingdom, during the last autumn, affords much seasonable information in regard to the real feelings of the Swedish people, to the policy of their rulers, and to the resources by which their interference may be supported. We say nothing of the particular merits of the volume, because it is impossible that Dr. THOMSON could write a bad or uninteresting book; and on this occasion his varied powers and comprehensive views are aided by the temporary interest of his general subject. The most valuable parts of his work are his detailed observations on the mineralogy of Sweden; but to this portion, so interesting to the scientific reader, we feel it impossible to do justice in the form of extract.]

GOTTENBURG MERCHANTS.

THE principal merchants in Gottenburg are Scotchmen. In consequence of letters of introduction which we carried to several of them, we experienced from that liberal and respectable body a profusion of kindness and politeness which it was impossible to surpass, and which it would be very difficult to equal. The want of inns, and our ignorance of the Swedish language, would have made it very difficult for us to have procured dinner while we stayed at Gottenburg, but this difficulty was obviated by the merchants, with one or other of whom we dined every day during our stay in that city.

ENTERTAINMENTS.

The Swedes are fond of great parties. I have more than once sat down to table with nearly fifty people in a private house. The hour of dinner is two o'clock. After the company are assembled they are shown into a room adjoining the dining-room. In the middle of this room there is a round table covered with a table-cloth, upon which are placed bread, cheese, butter, and corn-brandy. Every person eats a morsel of bread and cheese and butter, and drinks a dram of brandy, by way of exciting the appetite for dinner. There are usually two kinds of bread; namely, wheat-bread baked into a kind of small rolls, for I never saw any loaves in Sweden; and rye, which is usually baked in thin cakes, and is known in Sweden by the name of *nickebroed*. It is very palatable, but requires good teeth to chew it.

After this whet, the company are shown into the dining-room, and take their seats round the table. The first dish brought in is salmagundy, salt fish, a mixture of salmon and rice, sausages, or some such strong seasoned article, to give an additional whet to the appetite. It is handed round the table, and every person helps himself in succession to as much of it as he chooses. The next dish is commonly roasted or stewed mutton, with bacon ham. These articles are carved by some individual at table, most commonly the master of the house, and the carved pieces being heaped upon a plate are carried round the company like the first dish. The Swedes, like the French, eat of every thing that is presented at table. The third dish is usually soup, then fowls, then fish (generally salmon, pike, or streamlings), then pudding, then the dessert, which consists of a great profusion of sweet-meats, in the preparation of which the inhabitants of Gottenburg excel. Each of these dishes is handed about in succession. The vegetables, consisting of potatoes, carrots, turnips, cauliflowers, greens, &c. are handed about in the same way. During the whole time of dinner a great deal of wine is drunk by the company. The wines are claret, port, sherry, and madeira. What they call claret at Gottenburg does not seem to be Bourdeaux wine. It is a French wine with a taste intermediate between claret and port. At Stockholm, I drank occasionally true claret; but scarcely in any other part of Sweden. As all the wine used in Sweden is imported from Great Britain, our wine merchants can probably explain this circumstance though I cannot.

After tea the company usually sit down to cards; supper is served up about nine, and the party separate for the

the evening between eleven and twelve. In some houses, the interval between tea and supper was filled up by music. The Swedish instrument is a kind of harpsichord, not equal in its tones to our pianoforte. The music played is always Italian, and some of the ladies usually accompany the instrument with their voice.

VICINITY OF GOTTENBURG.

The country round Gottenburg is the most singular which I ever saw. It consists of low precipitous ridges of rocks, running in various directions, and quite naked. They vary from 100 feet above the level of the sea to about 300. The highest which I measured, and it was the highest I observed, was 310 feet high. These ridges are separated from each other by valleys about a mile wide. These valleys afford a tolerable soil, and are cultivated. The only crops we saw were of rice, and big (a small barley): they were nearly ripe, but in a very filthy state, being in many places almost choked with thistles and other injurious weeds. Indeed the state of agriculture in this place is much lower than in any other part of Sweden that I have seen.

TRAVELLING.

As there are no stage-coaches, it is necessary for every traveller to be provided with a carriage of his own. It ought to be light, and in summer an open carriage is much more useful and agreeable than any other. The horses in Sweden are small but very active, and remarkably sure footed. Notwithstanding the great number of horses which I employed, in a journey of above 1200 miles, I never saw one of them stumble. Their harness consists of little else than common ropes, which you supply yourself. In general, about half an hour was requisite to yoke a couple of horses to our carriage. Posting is under the regulation of government. Post-houses are provided at regular distances all over the country. The person who keeps these houses is called the *gästgifvar*, and he is obliged by law to keep a certain number of horses for posting. These vary from one to twenty, but the usual number is two, four, or six. Besides these, there is a certain number which the peasants in the neighbourhood are obliged to furnish, and to send once a day to the post-house; these are called *hollhäster*, or relay horses; these vary from two to twenty-two. In some counties, as Smoland, where the population is small, and the intercourse not great, there are no *hollhäster* at all. In travelling through such counties, unless you take care to send a person before you, you are quite sure to be detained several hours at each stage before horses can be procured. There is a third class of horses, called reserve horses, and which in fact consist of all the horses in the district. These the post-master is entitled to call upon in case of necessity; but a considerable time always elapses before they can be procured. If you wish to drive rapidly in Sweden, you must send a person before you, to order horses by a particular hour. This person is called a *forbod*, and by means of him you may travel as rapidly in Sweden as in England.

ROADS.

I was very much struck with the goodness of the roads in Sweden: they are narrower than our British roads, and sometimes you meet with pretty steep pulls in them; but they are all so smooth that they convey the idea of travelling in a gentleman's park. The roads are under the charge of peasants, each of whom has a certain number of feet of road which he is obliged to keep in repair. These distances are all carefully marked off by small pieces of board, upon which are painted the initials of the peasant who has the charge of that portion of road.

CULTIVATION.

All the land under culture in Sweden is inclosed, not with quickset hedges or stone-walls as in Britain, but with a wooden paling. The only part of Sweden where hawthorn hedges are to be seen is the neighbourhood of Gottenburg, and the custom has doubtless originated with the British merchants settled there. In Scania I observed a hedge made of sloe-bushes; but the practice was not generally followed. The Swedish palings are very different from ours, and occasion a prodigious waste of wood. Two stakes are driven into the ground at a little distance from each other, and between four and six feet high: these are tied together in three or four places at equal distances by a kind of rope made of birch bark. A row of such double stakes at the distance of about four feet from each other goes quite round the field to be inclosed. The whole space from the ground to the top of these stakes is filled up with pieces of fir-wood lying above each other, and kept in their places by the double stakes, and the birch ropes which support them.

The corn on the sides of the road was nearly ripe: it consisted of rye and big, and a few ridges of oats. The crops in general looked well, except that they were exceedingly foul. The mode of farming was very singular. The fields were all divided into pretty broad ridges, which were occupied alternately with different kinds of grain. The first ridge in the field we shall suppose was rye, the second grass, the third big, the fourth potatoes, the fifth oats; and in this way they alternated over the whole field.

PEASANTRY.

The appearance of the Swedish peasantry is very striking to a native of Great Britain, who is accustomed to so great a diversity in the features of the people with whom he associates. The Swedes have all light flaxy hair, and a ruddy countenance. I would say that a certain degree of flabbiness is visible in their complexions. There is nothing to be seen which indicates the existence of the more violent passions; but every one expresses a docility and good humour in his face, which I believe all possess, almost to a man. I have often gone into a Swedish cottage in the middle of the night, where the whole family, to the number of six or eight, were asleep in different beds; awakened the whole family, and sent the hollenkarr to ramble through the woods in the dark, to a distance of three or four miles, in quest of horses. The family were made to get up, and kept out of bed perhaps for two or three hours. All the while they preserved the most perfect good humour, never attempted to persuade you to stop all night, nor seemed to feel the inconvenience.

The peasants in Sweden seem to be a most amiable and innocent race. Most of them can read and write; they are all clean and well dressed in coarse blue cloth, manufactured in Sweden.

THE DIET.

Orebro is the place where the Swedish Diet occasionally meets; a circumstance which gives it more importance than it otherwise would be entitled to from its size. The Diet, as is well known, is the supreme court in Sweden, and similar in many respects to the Parliament of Great Britain. It consists of four distinct bodies of men, who meet in separate houses. These are—the nobles, the clergy, the peasants, and the burghers or inhabitants of towns.

1. There are three orders of nobility in Sweden, Counts, Barons, and noblemen without any title. When a family is once ennobled, all the descendants and collateral branches are noble. So that the number of noblemen in Sweden must increase with the population of the country. The number of noble families in Sweden amounts to about 1200.

2. The second house of the Diet consists of the clergy. The religion in Sweden is the Lutheran; and the different orders of clergy are bishops; *domprosts*, or deans; *prosts*, or archdeacons; *pastors*, or rectors; and *comministers*, or perpetual curates. There are twelve dioceses; namely, one archbishopric and eleven bishoprics. These are the archbishopric of Upsala, and bishoprics of Hernösands, Strängnäs, Vesteros, Carlstads, Linköping, Kalmare, Vexio, Skara, Gottenburg, Lunds, and Visby. There are 170 archdeacons, and 3,620 rectors and perpetual curates.

The number of representatives of the clergy is uncertain, because each district may either send up a representative of its own, or join with the neighbouring district and send one between them. They usually vary from fifty to about eighty.

3. The third house of the Diet consists of the peasants, a class of men that do not exist at all in Great Britain, and therefore require to be particularly explained. In Sweden, there is no class of men equivalent to our British farmers; that is to say, men who pay a certain annual rent to the proprietor of the farm, in order to be allowed to cultivate it. The only farmers in Sweden are either proprietors of the land, similar to our country gentlemen, or they are peasants. Now a Swedish peasant is a man employed in agriculture, possessing land of a certain tenure, who has never followed a trade, nor enjoyed a civil office. So that a peasant is a man whose ancestors have been always farmers.

The peasants are elected in the following manner: the governor of the province sends the writ to the county judges, who summon the peasants within their respective jurisdictions to meet in the court of justice on the day of election. The members are chosen by a majority of votes; the electors pay their constituents from three to five shillings a day during the sitting of the Diet; the number of representatives is uncertain. Each district may send two deputies; or two districts may unite together and send only one. In general the House of Peasants consists of about 100.

4. The

4. The fourth House of the Diet consists of the citizens. The number of towns in Sweden amounts to about 100. Every freeman of these towns, who pays taxes to the town, and has reached the age of twenty-one, is an elector. Every citizen who has been a freeman for seven years, or an alderman for three, and reached the age of twenty-four, may be elected. The number of freemen bears but a small proportion to the inhabitants of the towns.

SWEDISH ACADEMY.

The Swedish Academy, like the Royal Society of London, is quite free, receiving no other mark of favour from the crown than protection. They have a considerable income, derived chiefly from presents and legacies left them by the lovers of science in Sweden; their number is unlimited. At present it amounts to about 100 Swedish, and 60 foreign members; they publish their Transactions quarterly in the octavo form, and the four annual numbers make a thin volume: they embrace all the different branches of natural philosophy and natural history; and their Transactions, written in the Swedish language, constitute a splendid monument of their genius and industry. Natural history occupies a considerable part of those volumes, which I have particularly examined. They have kept a very accurate journal of the weather at Stockholm, ever since their institution in 1739, and some curious meteorological papers have appeared in their Transactions. The Royal Observatory at Stockholm is under their direction, and the astronomical observations of Wargentin, and the skill with which a degree of the meridian was measured by them within the polar circle in 1802, testify the progress they have made in mathematics and astronomy. The last Secretary of the Academy was a mathematician; the present is a botanist. This may perhaps occasion a difference in the complexion of the Transactions, and thus upon the whole add to the variety and consequent interest of their labours.

There is a considerable library belonging to the Academy, a very great portion of which consists of foreign books, chiefly in the German and French languages; though there are likewise a considerable number of English books.

COLLEGE OF MINES.

I spent several days in looking over the collection of minerals belonging to the College of Mines. It is very extensive, consisting of specimens from all the provinces of Sweden, arranged according to their localities. Such a collection, from the very nature of it, must abound in repetitions; but it is valuable by conveying a general idea of the mineral productions of every part of the country. The specimens are not always well chosen, and they are rather dirty, which makes it more difficult to determine their nature. Iron ores are by far the most numerous: copper ores come next. Lead is uncommon, and the other metallic ores in such small quantities that they scarcely deserve to be noticed. The rocks are mostly primitive or floetz trap. I saw not a single specimen of a transition rock in the collection, and but few of floetz rocks. The most showy mineral in the collection was the garnet, some of which are of a great size, and very regularly crystallized. The finest specimens came from Fahlun, where they are now scarce. I saw specimens of spinell in lime-stone, discovered by Mr. Svedenstierna. The lime was used to facilitate the fusion of iron ore, and the workmen complained that it did not answer the purpose, and that the more lime they added, the more infusible the iron ore became. The discovery of the spinell, which was scattered in profusion through the limestone, explained this anomaly. The same skilful mineralogist discovered zircon in the iron ore of Gellivare. In some of the specimens of that ore, in the cabinet of the College of Mines, the crystals of zircon were very distinct.

The cabinet of the College of Mines contains likewise a good many foreign specimens, chiefly from Britain and France. Many of them were beautiful and valuable; but to me, whose object it was to see as many Swedish minerals as possible, they were not so interesting as they would naturally be to a Swede. One of the greatest curiosities in the cabinet of the College of Mines, was a large specimen, which Mr. Hjelm informed me came originally from China. It consists of a large piece of a tree: in the centre it is perfect wood: as we approach the circumference, it becomes more and more petrified, and there is a zone at the outside more than two inches thick, of perfect woodstone. This specimen has been long in Stockholm. Mr. Hjelm knew nothing of its history except that it came from China.

THE SWEDISH ACADEMY.

Besides the Academy of Sciences, there is another academy at Stockholm, instituted by Gustavus III., and distinguished by the name of the Swedish Academy.

It consists of eighteen members; and the object of it was to polish and fix the Swedish language, as the French language was by the French Academy. I do not know that the members of this Academy have hitherto done any thing towards accomplishing the object of their institution. But there can be no doubt that the field before them is an ample one, and well worth their exertions. The Swedish language has proceeded from the original Scandinavian, which has now branched itself out into three languages, the English, the German, and the Swedish.

The words of the Swedish language bear so close a resemblance to the German, that a person well acquainted with the latter language may, without much trouble, make himself acquainted with the former. The idiom is almost exactly English, so that you may turn most Swedish sentences, word for word, into English, and they will make sense. There are a good many Swedish words which resemble the English very closely, either in their spelling or pronunciation. So that to a native of Britain, the Swedish language is not attended with much difficulty.

The Swedes have all the letters of our alphabet, and three more, with which they conclude their alphabet; these are, å, ä, ö pronounced *o*, *ai*, and the last like the French *u*. These letters no doubt were originally the diphthongs *ao*, *ae*, *oe*. One of the most striking irregularities in the Swedish alphabet is the use that they make of the letter *k*. It is used precisely as *c* is with us; that is to say, before the hard vowels it sounds like our *k*, but before the soft vowels it has the sound of our *ch* in *church*.

THE LATE KING.

Before I went to Sweden, I was strongly impressed with a high opinion of the late King of Sweden, Gustavus Adolphus IV. as it had been drawn with so much zeal and apparent truth in *the British Newspapers*. I disapproved of the Swedish revolution, and was eager to learn the opinion entertained of it by well informed people in Sweden. I found every person concur in the same opinion, while the picture drawn of the conduct of Gustavus Adolphus was so different from what I had conceived from the statements in the English newspapers, that I was unwilling to admit it, and I yielded only to the evidence of well authenticated facts.

Gustavus IV. possessed certain qualities which gave him a resemblance to Charles XII. the prince whose conduct he considered as a model for his imitation. Like Charles, he had an obstinacy of character so great, that it was impossible to induce him to alter any resolution, however absurd or ridiculous, which he had once formed, even though it were demonstrated to him by the clearest evidence, that persisting in it could lead only to disaster and ruin. Another quality in which he resembled Charles XII. was in his capacity of enduring cold, which was uncommonly great. He used to travel in the winter with only a slight covering, when his courtiers were trembling with cold under the load of two or three great-coats and surtouts.

Instead of defending his own frontiers, he left them defenceless to the invading enemy, while the whole of his attention was turned to romantic schemes, altogether beyond the power of his resources to realize. He had early become the submissive votary of religion, or, more accurately speaking, of superstition, and during his travels in Germany, he got hold of a commentary on the Revelation, by a man of the name of Jung, which, though originally written in German, had been translated into Swedish. This book became the subject of his assiduous study; the opinions which it contained, were implicitly adopted, and regulated all his conduct. The second beast described in the 13th chapter of the Revelation, whose power was to be but of short duration, was considered by him as Bonaparte; because some commentator had shown that the letters in the name Napoleon Buonaparte make out the number 666, which is the mark of the beast.

In consequence of this discovery, he ordered the name of the French emperor, in all the Swedish newspapers, to be always printed N. Buonaparte, and as the real reason of this whimsical charge was concealed by his ministers, it excited considerable curiosity in the country, and nobody was able to explain it in a satisfactory manner. He easily persuaded himself that he was the person destined by Heaven to overturn the dominion of the beast, and that the verse in the 6th chapter of the Revelation, which is as follows, applied to himself:

"And I saw and behold a white horse; and he that sat on him had a bow, and a crown was given unto him: and he went forth conquering and to conquer."

Gustavus

Gustavus IV. possessed some skill as a practical painter. At Gripsholm he drew a picture of himself seated upon a white horse, and trampling the beast under his feet. So firmly was he convinced of the truth of all these predictions, that he thought nothing more was necessary than to refuse to treat with Bonaparte. No preparations on his part would be requisite to enable him to fulfill the intention of heaven. When besieged in Stralsund by a French army, he expected the visible interposition of an angel in his behalf. But when this angel, who was to be four German miles in height, did not appear, and the French batteries were nearly completed, he thought it requisite to attend to his own safety, and retreat to the island of Rugen.

His own notion of military tactics, *like that of some other princes*, was that it consisted in nothing else than regulating the military uniforms: this was with him a point of such importance, that when the supplementary troops were raised, he spent the greatest part of a year in devising the shape of their coats, while, in the mean time, the poor recruits were left so entirely without every means of comfort, that many actually died of cold and hunger.

I am conscious that this picture of the conduct and capacity of Gustavus IV. is very different from what is generally entertained in this country. It is very different from what has been uniformly inculcated in all *our newspapers*, and, indeed, as different as possible from the opinion which I myself entertained before I went to Sweden. But it is an opinion which must be adopted by every person who will make himself acquainted with the facts which took place in Sweden during his reign.

LATE REVOLUTION.

Three powerful nations were preparing to invade and divide the kingdom of Sweden among them. Gustavus had quarrelled with his only ally, and obstinately refused to listen to any terms of peace with France and Russia; though it was demonstrated that such a peace was essentially necessary for the interests of his country, and that perseverance in the war could lead to nothing else than complete ruin.

The liberty of the press had been totally annihilated in Sweden, so that the people in consequence were but imperfectly acquainted with the state of Europe. The king had all along been very popular with the people, who, ignorant of his real character, ascribed all his errors in Germany to the want of capacity of his ministers. Even the commencement of the Russian and Danish war did not alter their sentiments, and the losses sustained in Finland served only to irritate the minds of the people. Popular enthusiasm was raised to the highest pitch, and the most glorious results would have taken place had the throne been filled by a prince who understood how to profit by the disposition of his subjects. But the management of the war in the summer and autumn of 1808, opened the eyes of the whole Swedish nation. The deplorable state of the finances, *the determination of the King never to make peace*, and the absurd plans which he had projected for the next campaign, awakened in the mind of every thinking man the necessity of taking *some immediate step to save their tottering country*.

Colonel Adlesparre, who commanded the western army, conducted his troops to Carlstadt, harangued the different regiments in succession in the market place, informed them of the hazardous enterprize which he had undertaken, and the necessity of such measures for the safety of their country. The troops unanimously entered into his views, and offered to sacrifice their lives for the salvation of their country. A detachment was sent to take possession of Gottenburg, while Colonel Adlesparre marched with the rest of his army to Orebro.

The conspirators, at Stockholm, were sensible that the King's retreat ought, at all hazards, to be prevented, and, therefore, resolved upon attempting to seize his person next day, the 13th of March, before he should have leisure to put any of his plans in execution. Baron Adlercreutz, who had come to Stockholm on purpose, and who had acquired reputation by his conduct in the Finland war, agreed to take the lead on this occasion.

Baron Adlercreutz, Count Klingspor, Colonel Silfversparre, and many other officers who were in the secret, assembled in the palace by eight o'clock in the morning. The number of conspirators within the palace amounted to about fifty.

Baron Adlercreutz now went round and desired those who were stationed at the gates and the other parts of the palace to be vigilant on their parts, and having collected a number of officers he entered

entered the King's room. When the door opened, the King seemed surprised; the Baron immediately approached and said, "That the public mind was in the utmost irritation from the unfortunate state of the country, and particularly from his Majesty's intended departure from Stockholm: that the higher officers of state, the troops, and the most respectable citizens, had encouraged him to represent the consequences to his Majesty, for which purpose"—here the King loudly exclaimed, "Treason! you are all corrupted and shall be punished!" The Baron answered, "We are no traitors, but wish to save your Majesty, and our country." The King immediately drew his sword, the Baron rushed upon him and seized him round the waist, while Colonel Silfversparre took the sword out of his hand; the King then cried out, "They are going to murder me, help! help!"—They endeavoured to re-assure the King, and he promised to be more composed if they would return his sword; he was told that in this respect he could not be gratified, nor be permitted any more to interfere in the management of the kingdom.

The Duke of Sudermania took upon him the government. The change was immediately proclaimed and received with acclamations by the people. Hardly any revolution was ever brought about with greater facility. No tumult ensued; no blood was shed in any part of the kingdom, and not a single murmur expressed at the dethronement of the King.

At two o'clock in the morning, the King was conveyed to Drottningholm, and a few days after to Gripsholm.

THE CROWN PRINCE.

A new Crown Prince was to be elected, and various candidates offered themselves. It is universally known that the choice fell upon Bernadotte, Prince of Ponté Corvo, who at that time had the command of a French army in the north of Germany, and who had begun his career as a private soldier in the French army. By what secret springs this election was conducted it was quite impossible to learn. But the nature of the choice, and the war with Great Britain, lead one strongly to suspect the all-powerful application of French influence. The Swedes all vehemently deny the existence of any such influence, and affirm that the election of Bernadotte was very much contrary to Bonaparte's wishes. But I do not believe that any one of those persons, with whom I conversed on the subject, had any means of acquiring accurate information. The secret means employed were probably known only to a very small number of individuals, and Bernadotte's consummate prudence, for which he is very remarkable, will probably bury the real truth for ever in oblivion, unless some unforeseen change in the affairs of Europe should make it his interest to divulge the secret.

It is affirmed in Sweden, that a coolness had for some time existed between Bonaparte and the Prince of Ponté Corvo, in consequence of Bonaparte, upon some occasion or other, throwing up to him his original rank of a private soldier. Such a story is well suited to the impetuous rudeness which characterizes Bonaparte; but it does not agree with the mild temper and consummate prudence of Bernadotte. To judge from appearances, he has not a good opinion of his own countrymen, for not a single Frenchman is employed either in the Swedish army or in any other situation, and all the applications which have been made to him by Frenchmen have been uniformly refused. It was he that brought about a peace between Great Britain and Sweden. The French Emperor was hurt at his conduct, and in consequence took possession of Swedish Pomerania.

Nothing would have been easier for him than to have induced Sweden to enter into an alliance with France. The Swedish nobility have all had a French education, and they have adopted a good deal of the manners and opinions of that volatile and unprincipled nation. The Swedes have been so long accustomed to an alliance with France, that it has become in some measure natural to the nation. They have imbibed the opinions, which Bonaparte has divulged with so much industry, respecting the danger of Great Britain holding the dominion of the sea, and the injury which British commerce and British manufactures do to other nations. These opinions I admit to be inconsistent with the knowledge of the first principles of commerce and even of common sense, and show a most miserable ignorance of the real interests and real state of Europe. Yet I have heard them gravely maintained by some of the most sensible men in Sweden. If to all this we add the severe treatment which they have met with from the Russians, and the natural jealousy which every nation must have of a powerful and encroaching neighbour, w-

shall not be surprised that the great body of the Swedes in the present war take the part of the French, and are secretly hostile to Britain and Russia. When I was at Stockholm this appeared very strongly marked. When any news arrived of successes gained by the Russians the faces of every one you met indicated disappointment and uneasiness. When news arrived of successes gained by the French, every person was in ectasy.

SWEDISH POLICY.

Situated as Sweden is at present, she can never hope to rise to the rank of a European power of the first magnitude. She is surrounded by two nations, with whom she has been at war for two centuries; against whom of course she has contracted an indelible hatred. These nations are Russia and Denmark. The former of them is such a prodigious overmatch for Sweden, both in extent of territory and number of inhabitants, that she can never hope to wage with her more than a defensive war, and is utterly unable to wrest from her any of those ancient territories which once belonged to the Swedish crown. But as far as defensive war is concerned, she is now much more invulnerable than at any former period. Separated on all sides from Russia by the sea, or by frozen regions, through which it is scarcely possible to march, she has only to keep up a respectable naval force to bid defiance to all the efforts of that mighty empire. Her naval force was nearly annihilated during the late Russian war; but she ought immediately to restore it to its former footing, and, as a farther security, cultivate the friendship of that power which is best able to protect her, by having the command of the sea.

In consequence chiefly of the intimate connection which subsisted for so long a period between Great Britain and Russia and Denmark, Sweden threw herself into the arms of France, and formed herself upon the model of that empire. Her nobles were educated in France, and French manners were universally prevalent among the higher ranks. These prepossessions have left their natural effects behind them, and, notwithstanding the great change in the state of Europe, and the new interests which ought to direct the friendships of Sweden, her people still retain their old partiality to France, and secretly rejoice at the successes of Bonaparte, and mourn over any of his disasters.

A FUNERAL SERMON,

Preached at the

INTERMENT OF THE VICTIMS,

By the Rev. JOHN HODGSON,

WITH AN

Introductory Account

OF THE

DREADFUL ACCIDENT

Which happened at

FELLING COLLIERY, near Sunderland,

On MAY 25, 1812.

[The affecting character of the circumstances described in the following narrative, will doubtless serve as an apology for drawing the attention of our readers to the original, which was published as a means of augmenting a fund for the benefit of the sufferers.]

FELLING is a manor about a mile and a half east of Gateshead. It contains several strata of coal, the uppermost of which were extensively wrought in the beginning of the last century. The stratum called the High-main, was won in 1779, and continued to be wrought till the 19th January, 1811, when it was entirely excavated. The present colliery is in the seam called the Low-main. It commenced in October, 1810, and was at full work in May, 1812. This mine was considered by the workmen as a model of perfection in the purity of its air, and orderly arrangements—its inclined plane was saving the daily expense of at least 13 horses—the concern wore the features of the greatest possible prosperity, and no accident, except a trifling explosion of fire-damp, slightly burning two or three workmen, had occurred. Two *shifts* or sets of men were constantly employed, except on Sundays. Twenty-five acres of coal had been excavated. The first shift entered the mine at four o'clock A. M. and were relieved at their working posts by the next at 11 o'clock in the morning. The establishment it employed under-ground, consisted of about 128 persons, who, in the fortnight from the 11th to the 25th of May, 1812, wrought 624 scores of coal, equal to 1300 Newcastle chaldrons, or 2455 London chaldrons. About half past eleven o'clock on the morning of the 25th May, 1812, the neighbouring villages were alarmed by a tremendous explosion in this colliery. The subterraneous fire broke forth with two heavy discharges from the *John*, which were, almost instantaneously, followed by one from the *William*. A slight trembling, as from an earthquake, was felt for about half a mile around the workings; and the noise of the explosion, though dull, was heard to three or four miles distance, and much resembled an unsteady fire of infantry.

Immense

Immense quantities of dust and small coal accompanied these blasts, and rose high into the air, in the form of an inverted cone. The heaviest part of the ejected matter, such as corves, pieces of wood, and small coal, fell near the pits; but the dust, borne away by a strong west wind, fell in a continued shower from the pit to the distance of a mile and a half. As soon as the explosion was heard, the wives and children of the workmen ran to the working-pit. Wildness and terror were pictured in every countenance. The crowd from all sides soon collected to the number of several hundreds, some crying out for a husband, others for a parent or a son, and all deeply affected with a mixture of horror, anxiety, and grief. The machine being rendered useless by the eruption, the rope of the gin was sent down the pit with all expedition. In the absence of horses, a number of men, whom the wish to be instrumental in rescuing their neighbours from their perilous situation, seemed to supply with strength proportionate to the urgency of the occasion, put their shoulders to the starts or shafts of the gin, and wrought it with astonishing expedition. By twelve o'clock, 32 persons, all that survived this dreadful calamity, were brought to day-light. The dead bodies of two boys, who were miserably scorched and shattered, were also brought up at this time: three boys, out of the 32 who escaped alive, died within a few hours after the accident. Only 29 persons were, therefore, left to relate what they observed of the appearances and effects of this subterraneous thundering: 121 were in the mine when it happened, and 87 remained in the workings. *Eight persons* came up at different intervals, a short time before the explosion. They who had their friends restored, hastened with them from the dismal scene, and seemed for a while to suffer as much from the excess of joy as they had lately done from grief; and they who were yet held in doubt concerning the fate of their relations and friends, filled the air with shrieks and howlings; went about wringing their hands; and threw their bodies into the most frantic and extravagant gestures. The persons who now remained in the mine, had all been employed in the workings to which the plane-board was the general avenue, and as none had escaped by that way, the apprehension for their safety began to strengthen every moment. At a quarter after twelve o'clock, Messrs. Straker, Anderson, Haswell, Rogers, Wilson, Pearson, Anderson, Menham, and Greener, therefore descended the *John*, in expectation of meeting with some of them alive. As the fire-damp would have instantly ignited at candles, they lighted their way by *steel-mills*, small machines which give light by turning a plain thin cylinder of steel against a piece of flint. Knowing that a great number of the workmen would be at the crane when the explosion happened, they attempted to reach it by the plane-board; but their progress was intercepted at the second pillar by the prevalence of choak-damp: the noxious fluid filled the board between the roof and the thill; and the sparks from the steel fell into it like dark drops of blood. Being, therefore, deprived of light, and nearly poisoned for want of atmospheric air, they retraced their steps to the shaft, and with similar success attempted to pass up the narrow boards: in these they were stopped at the sixth pillar by a thick smoke, which stood like a wall the whole height of the board. Here their flint-mills were not only rendered useless, and respiration became extremely difficult, but the probability of their ever reaching the places where they expected to meet with those they were in search of, or of finding any of them alive, was entirely done away. To the hopelessness of success in their enterprize should also be added, their certainty of the mine being on fire, and the probability of a second explosion at every moment occurring and burying them in its ruins.

At two o'clock Mr. Straker and Mr. Anderson had just ascended the *John*, and were gone to examine the appearance of the air issuing from the *William*. Menham, Greener, and Rogers, had also ascended. Two of the party were at this moment in the shaft, and the other two remained below, when a second explosion, much less severe than the first, excited more frightful expressions of grief and terror amongst the relatives of the persons still in the mine. Rogers and Wilson, the persons in the shaft, experienced little inconvenience by the eruption: they felt an unusual heat, but it had no effect in lifting up their bodies, or otherwise destroying the uniformity of the motion of their ascent. Haswell and H. Anderson, hearing its distant growlings, laid themselves down at full length on their faces, and in this posture, by keeping firm hold of a strong wooden prop, placed near the shaft, to support the roof of the mine, experienced no other inconvenience from the blast, than its lifting up their legs and poising their bodies in various directions, in the manner that the waves heave and toss a buoy at sea. As soon as the atmospheric current returned down the shaft, they were drawn to bank. This expedient of lying down and suffering the fury of the blast to roll over them, is mentioned in the Life of Lord Keeper North, under the year 1676. It is most efficacious where the mine is wet, for atmospheric air always accompanies running water; but the warning of a blast being usually sudden, it requires a degree of experience and coolness, not commonly united, to exercise any precaution against

it. The miner knowing its irresistible power, instantly sees the inefficacy of every attempt to escape, and, like a physician attacked by some incurable complaint, and, conscious that his art is unequal to its cure, makes no struggle to save his life.* As each of the party came up, he was surrounded by a group of anxious inquirers. All their reports were equally hopeless; and the second explosion so strongly corroborated their account of the impure state of the mine, that their assertions for the present seemed to be credited. But this impression was only momentary. On recollection, they remembered that persons had survived similar accidents, and when the mine was opened, been found alive. Three had been shut up during 40 days in a pit near Byker, and all that period had subsisted on candles and horse beans. The proposition to exclude the atmospheric air from the mine, in order to extinguish the fire, was therefore received with the cries of "*Murder*," and with determinations of opposing the proceeding. Many of the widows continued about the mouth of the *John* Pit during the whole of Monday night, with the hope of hearing the voice of a husband or a son calling for assistance. On Tuesday the 26th of May, the natural propensity of the human mind to be gratified with spectacles of horror was strongly exemplified. An immense crowd of colliers from various parts, but especially from the banks of the river Wear, assembled round the pits, and were profuse in reproaches on the persons concerned in the mine, for want of exertion to recover the men. Every one had some example to relate of successful attempts in cases of this kind,—all were large in their professions of readiness to give assistance; but none were found to enter the inflammable jaws of the mine. Their reasonings and assertions seemed indeed to be a mixture of those prejudices and conceits which cleave to workmen whom experience has afforded a partial insight into the nature and peculiarities of their profession, and not to be grounded on any memory of facts, or to result from a knowledge of the connection between causes and effects; and on this account, as soon as the leaders of the outcry could be brought to listen with patience to a relation of the appearances that attended this accident, and to hear the reasons assigned for the conclusion that the mine was on fire, and that the persons remaining in it were dead, they seemed to allow the impracticability of reaching the bodies of the sufferers, till the fire was extinguished, and consequently the necessity of smothering it out by excluding atmospheric air from the mine. On Wednesday the 27th of May, at the clamorous solicitation of the people, Mr. Straker and the overman again descended the *John* Pit, in order to ascertain the state of the air in the workings. Immediately under the shaft they found a mangled horse, in which they supposed they perceived some signs of life; but they had only advanced about six or eight yards, before the sparks of the flint were extinguished in the choak-damp, and Haswell, who played the mill, began to show the effects of the carbonic poison, by faultering in his steps. Mr. Straker therefore laid hold of him, and supported him to the shaft. As the baneful vapours had now taken possession of the whole of the mine, and they found it difficult to breathe even in the course of the full current of the atmospheric air, they immediately ascended. But the afflicted creatures, still clinging to hope, disbelieved their report. Wishful, therefore, to give as ample satisfaction as possible to the unhappy women, Mr. Anderson and James Turnbull (a hewer of the colliery, who had escaped the blast) again went down. At 30 fathoms from the bottom they found the air exceedingly warm: to exist without apoplectic symptoms for more than a few yards round the bottom of the shaft, was found impossible, and even there the air was so contaminated, as to be nearly irrespirable. When they ascended, their clothes emitted a smell somewhat resembling the waters of Gilsland and Harrowgate, but more particularly allied to that of the turpentine distilled from coal tar. The report of these last adventurers partly succeeded in convincing the people that there was no possibility of any of their friends being found alive. Some, indeed,

* Dr. Thomson, in his *Annals of Philosophy*, says, that "what is called *fire-damp* in coal-mines is the *carbureted hydrogen gas* of chemists. It is composed of

Carbon	72
Hydrogen	28
	100

or of seven atoms of hydrogen, and three of carbon. He conceives that fire-damp is formed by the action of coal upon water. The water is decomposed, two atoms at once. All the oxygen combines with carbon, and forms carbonic acid; while all the hydrogen unites likewise with carbon, and forms carbureted hydrogen, or fire-damp. We are not acquainted with any means of preventing the formation of this gas; but it certainly might be prevented from accumulating, by ventilating the mine properly. If the usual method of fires, &c. be insufficient, nothing would be easier than to pump the air out of the mine, by means of an engine; and this would secure a perfect ventilation at all times, unless we suppose the workmen culpably negligent."

deed, went away silent, but not satisfied; others with pitiable importunity besought that measures to recover their friends might even yet be adopted and persevered in; and many, as if grief and rage had some necessary connection, went about loading the conductors of the mine with execrations, and threatening revenge. Some were even heard to say they could have borne their loss with fortitude had none of the workmen survived the calamity; they could have been consoled had all their neighbours been rendered as miserable and destitute as themselves! From such a multitude of distracted women, unanimity of sentiment could not be expected—no scheme of proceedings could be invented fortunate enough to meet with the approbation of them all. In the evening of this day it was, therefore, resolved to exclude the atmospheric air from entering the workings, in order to extinguish the fire which the explosion had kindled in the mine, and of which the smoke ascending the *William* Pit was a sure indication. This shaft was accordingly filled with clay about seven feet above the *ingate* or entrance from the shaft into the drift; and the *John* Pit mouth was covered over with loose planks.

Many idle tales were circulated through the country concerning several of the men finding their way to the shafts, and being recovered. Their number was circumstantially told—how they subsisted on candles, oats, and beans—how they heard the persons who visited the mine on the day of the accident, and the Wednesday following, but were too feeble to speak sufficiently loud to make themselves heard. Some conjurer too, it was said, had set his spells and divinations to work, and penetrated the whole secrets of the mine. He had discovered one famishing group receiving drops of water from the roof of the mine—another eating their shoes and clothes, and other such pictures of misery. These inventions were carefully related to the widows, and answered the purpose of every day harrowing up their sorrows afresh. Indeed, it seemed the chief employment of some, to make a kind of insane sport of their own and their neighbours' calamity.

The morning of Wednesday the 8th of July, being appointed for entering the workings, the distress of the neighbourhood was again renewed at an early hour. A great concourse of people collected—some out of curiosity—to witness the commencement of an undertaking full of sadness and danger—some to stir up the revenge and aggravate the sorrows of the relatives of the sufferers, by calumnies and reproaches, published for the sole purpose of mischief; but the greater part came with broken hearts and streaming eyes, in expectation of seeing a father, a husband, or son, "brought up out of the horrible pit!"

As the weather was warm, and it was desirable that as much air might pass down the shaft as possible, constables were placed at proper distances, to keep off the crowd. Two surgeons were also in attendance in case of accidents.

At six o'clock in the morning, Mr. Straker, Mr. Anderson, the overman of the colliery, and six other persons, descended the William Pit, and began to traverse the north drift towards the plane board. As a current of water had been constantly diverted down this shaft for the space of ten hours, the air was found to be perfectly cool and wholesome. Light was procured from steel-mills. As the explosion had occasioned several *falls* of large masses of stone from the roof, their progress was considerably delayed by removing them. After the plane-board was reached, a stopping was put across it on the right hand, and one across the wall opposite the drift. The air, therefore, passed to the left, and number *six* was found.

The *shifts* of men employed in this doleful and unwholesome work, were generally about eight in number. They were four hours in and eight hours out of the mine: each individual, therefore, wrought two shifts every 24 hours.

When the body of number six was to be lifted into a shell or coffin, the men for a while stood over it in speechless horror: they imagined it was in so putrid a state, that it would fall asunder by lifting. At length they began to encourage each other "in the name of God" to begin; and after several hesitations and resolutions, and covering their hands with oakum to avoid any unpleasant sensation from touching the body, they laid it in a coffin, which was conveyed to the shaft in a bier made for the purpose, and drawn 'to bank' in a net made of strong cords.

When the first shift of men came up, at ten o'clock, a message was sent for a number of coffins to be in readiness at the pit. These being at the joiner's shop, piled up in a heap to the number of 92, (a most gloomy sight) had to pass by the village of Low Felling. As soon as a cart-load of them was seen, the howlings of the women, who had hitherto continued in their houses, but now began to assemble about their doors, came on the breeze in slow fitful gusts, which presaged a scene of much distress and confusion being soon exhibited near the pit; but happily, by representing to them the shocking appearance of the body that had been found, and the ill effects upon their own bodies and minds, likely to ensue from suffering themselves to be hurr-

hurried away by such violent convulsions of grief, they either returned to their houses, or continued in silence in the neighbourhood of the pit.

From the 8th of July to the 19th of September, the heart-rending scene of mothers and widows examining the putrid bodies of their sons and husbands, for marks by which to identity them, was almost daily renewed; but very few of them were known by any personal mark—they were too much mangled and scorched to retain any of their features. Their clothes, tobacco-boxes, shoes, and the like, were, therefore, the only indexes by which they could be recognised.

At the crane twenty-one bodies lay in ghastly confusion: some like mummies, scorched as dry as if they had been baked. One wanted its head, another an arm. The scene was truly frightful. The power of the fire was visible upon them all; but its effects were extremely various: while some were almost torn to pieces, there were others who appeared as if they had sunk down overpowered with sleep.

The ventilation concluded on Saturday the 19th of September, when the 91st body was dug from under a heap of stones. At six o'clock in the morning the pit was visited by candle-light, which had not been used in it for the space of 117 days; and at eleven o'clock in the morning the tube-furnace was lighted. From this time the colliery has been regularly at work; but the 92nd body has never yet been found.

All these persons (except four, who were buried in single graves) were interred in Heworth Chapel-yard, in a trench, side by side, two coffin deep, with a partition of brick and lime between every four coffins.

FRENCH BULLETIN, *descriptive of the* BATTLES *of* BAUTZEN, *&c. referred to in our* ACCOUNT *of* PUBLIC AFFAIRS, *at page* 543.

Paris, May 29.—Her Majesty the Empress Queen and Regent has received the following intelligence respecting the events which have passed at the army, during the days of the 19th, 20th, 21st, and 22d; and of the position of the army on the 23d:—

The Emperor Alexander, and the King of Prussia, attributed the loss of the battle of Lutzen, to the faults their generals had committed in the direction of their combined force, and particularly to the difficulties attached to an offensive movement of from 150 to 180,000 men. They resolved upon taking the position of Bautzen, and Hochkerch, already celebrated in the history of the seven-years' war; to unite there all the reinforcements which they expected from the Vistula, and other points in their rear; to add to that position every thing, for which art could furnish the means; and there run the chances of a fresh battle, of which all the probabilities appeared to them to be in their favour.

The Duke of Tarentum, commanding the 11th corps, left Bischosswerder on the 15th; in the evening of which day he found all the enemy. He took a position: from this moment the French army marched upon the camp at Bautzen.

The Emperor left Dresden on the 18th; he slept at Harla; and on the 19th, at ten in the morning, arrived before Bautzen. He employed all the day in reconnoitring the enemy's positions.

We learned that the Russian corps of Barclay de Tolly, Langeron, and Sass, and Kleist's Prussian corps had joined the combined army, and that its force might be estimated from 150 to 160,000 men.

On the 19th, in the evening, the enemy's position was as follows: his left was supported by mountains covered with wood, and perpendicular to the course of the Spree, nearly a league from Bautzen; Bautzen contained his centre. This town had been entrenched and covered by redoubts; the right of the enemy leaned upon fortified rising points, which defended the debouches from the Spree, from the side of the village of Nimschit; all his front was covered by the Spree; this very strong position was but a first position.

We distinctly perceived at 3,000 toises distance in the rear, the ground newly dug up, and works which marked their second position. The left was still supported by the same mountains at two thousand toises in the rear of those of the first position, and considerably in advance of the village of Hochkerch. The centre leaned upon three intrenched villages, where so many works had been erected that they might have been considered as strong places. A marshy and difficult ground covered three-quarters of the centre. Lastly, their right leaned in rear of the first position upon villages and rising ground, likewise intrenched.

The enemy's front, either in the first or second position, extended about a league and an half. After this reconnoissance, it was easy to conceive how, notwithstanding a lost battle like that of Lutzen, and eight days retreating, the enemy could still have hopes in the chances of fortune. According to the expression of a Russian officer, who was asked what they intended to do, "We neither wish to advance, nor retire." "You are masters of the first point," replied a French officer, "the event, in a few days, will prove whether you are masters of the other." The head-quarters of the

the two sovereigns were in the village of Natscher.

On the 19th, the position of the French army was as follows:—

Upon the right was the Duke of Reggio, leaning upon the mountains to the left of the Spree, and separated from the left of the enemy by that valley. The Duke of Tarentum was before Bautzen, on horseback, upon the Dresden road. The Duke of Ragusa was upon the left of Bautzen, opposite the village of Niemenschutz. General Bertrand was upon the left of the Duke of Ragusa, leaning upon a windmill and a wood, and appeared to intend debouching from Jaselitz upon the enemy's right. The prince of Moskwa, General Lauriston, and General Reynier, were at Hoyerswerda, out of the line, and in the rear of our left.

The enemy having learnt that a considerable corps was to arrive by the road of Hoyerswerda, was doubtful that it was the Emperor's intention to turn their position by the right, to alter the field of battle, and to cause all his intrenchments to fall which had been erected with so much pains, and the objects of such great trouble. Not being yet informed of General Lauriston's arrival, he did not suppose that this column could consist of more than 16 or 20,000 men. On the 19th he therefore detached against them, at four o'clock in the morning, General Yorck with 12,000 Prussians, and General Barclay de Tolly, with 18,000 Russians. The Russians posted themselves at the village of Klix, and the Prussians at the village of Weissig.

Count Bertrand had in the mean while sent General Pery, with the Italian division, to Koenigswerda, to keep our communication with the detached corps. Being arrived there at noon, General Perin made bad dispositions. He did not cause the neighbouring forest to be properly reconnoitred; he placed his posts badly, and at four o'clock he was assailed by a *hourra*, which threw some battalions into disorder. He lost 600 men, among whom was General Balathier, of the Italian brigade, wounded; 2 cannon, and 3 caissons; but the division having taken to their arms, kept themselves to the wood, and faced against the enemy.

The Count de Valmy having arrived with the cavalry, put himself at the head of the Italian division, and retook the village of Koenigswerda. At this very moment, the corps under Count Lauriston, which marched at the head of the Prince of Moskwa's, to turn the enemy's position, and had departed from Hoyersyerda, arrived on Weissig. The battle commenced, and the corps of General Yorck would have been destroyed, had it not been for the circumstance of the troops having to pass a defile, which caused that they could come up only in succession. After a battle of three hours, the village of Weissig was carried, and De Yorck's corps, being overthrown, was driven to the other bank of the Spree. The battle of Weissig was in itself an important event. A detailed report will shortly make known the particulars concerning it.

On the 19th, Count Lauriston therefore remained in the position of Weissig: the Prince of Moskwa at Mankersdof, and Count Reynier at the distance of a league in the rear. The right of the enemy's position was evidently in disorder.

On the 20th, at eight o'clock in the morning, the Emperor went to the heights in the rear of Bautzen. He gave orders to the Duke of Reggio to pass the Spree, and attack the mountains which supported the enemy's left; to the Duke of Tarentum, to throw a bridge on chevalets over the Spree, between Bautzen and the mountains; to the Duke of Ragusa, to throw another bridge on chevalets over the Spree, in the turn which that river takes to the left, at half a league from Bautzen; to the Duke of Dalmatia, (to whom his Majesty had given the command in chief of the centre) to pass the Spree, and disturb the enemy's right; and, finally, to the Prince of Moskwa, under whose orders were the third corps, General Lauriston, and General Reynier, to push forward on Klix, to pass the Spree, to turn the enemy's right, and to carry his head-quarters from Wurtchen to Weissenburg.

At noon the cannonade commenced. The Duke of Tarentum had no occasion to throw his bridge of cheval to cross the river, as he found a stone bridge before him, over which he forced his passage. The Duke of Ragusa threw his bridge across, and the whole of his corps passed over to the other bank of the Spree. After six hours of a brisk cannonade, and several charges made by the enemy without success, General Compans caused Bautzen to be occupied; General Bonnet occupied the village of Niedkayn, and by a running charge took a plain which rendered himself master of the whole center of the enemy's position; the Duke of Ragusa got possession of the heights, and at seven o'clock in the evening the enemy was driven back on his second position. General Bertrand passed one of the arms of the Spree; but the enemy kept the heights which supported his right; and by this means maintained himself between the Prince of Moskwa's corps and our army.

At eight o'clock in the evening, the Emperor entered Bautzen, and was received by the inhabitants and the constituted authorities, with sentiments due from allies, who were happy in finding themselves delivered from Stein, from Kotzebue, and the Cossacks. This day, which, were it single, might be called the battle of Bautzen, was

was merely the prelude to the battle of Wurtchen.

However, the enemy began to comprehend the possibility of being forced in his position. His hopes were no longer the same; and he must, from this moment, have had the presage of his defeat. Already were all his dispositions entirely changed. The fate of the battle was no longer to be decided behind his entrenchments. His immense works, and 300 redoubts, became useless. The right of his position, which was opposed to the 4th corps, became his centre; and he was obliged to offer his right, which formed a good part of his army, to oppose the Prince of Moskwa, in a place which he had not studied, and which he believed beyond his position.

On the 21st, at five in the morning, the Emperor marched towards the heights, three quarters of a league in advance of Bautzen.

The Duke of Reggio sustained a lively fire of musketry towards the heights which defended the enemy's left. The Russians, who felt the importance of this position, had placed a strong part of their army, in order that their left should not be turned. The Emperor ordered the Dukes of Reggio and Tarentum to keep up the combat, in order to prevent the enemy's left from disengaging itself, and to hide from him the real attack, the result of which could not be felt before noon or one o'clock.

At eleven o'clock the Duke of Treviso advanced 1000 toises from his position, and engaged in a dreadful cannonade before all the enemy's redoubts and entrenchments. The guards, and the reserve of the army, concealed by a rising ground, had easy debouches to advance, by the left or right, according as the vicissitudes of the day might require. The enemy was thus kept in uncertainty respecting the real point of attack. During this time, the Prince of Moskwa overthrew the enemy at the village of Klix, passed the Spree, and advanced, fighting what he had before him, to the village of Preiletz. At ten o'clock he carried the village; but the enemy's reserves having advanced to cover the head quarters, the Prince of Moskwa was driven back, and lost the village of Preiletz. The Duke of Dalmatia began to debouch an hour after noon. The enemy, who comprehended all the danger with which he was threatened by the direction the battle had taken, knew that the only means of advantageously supporting the battle against the Prince of Moskwa, was to prevent us from debouching. He endeavoured to oppose the Duke of Dalmatia's attacks. The moment for deciding the battle had then arrived. The Emperor, by a movement to the left, in twenty minutes marched with the guards, General Latour Maubourg's four divisions, and a great quantity of artillery, upon the right flank of the enemy's position, which had become the centre of the Russian army.

Morand's and the Wurtemberg division carried the rising ground, which the enemy had made his *point d'appui*.

General Devaux established a battery, the fire of which, he directed upon the masses which attempted to take the position. Generals Dulauloy and Drouet, with sixty pieces of reserve artillery, advanced. Lastly, the Duke of Treviso, with the divisions Dumontier and Barrois, with a detachment of the young guard, took the road to the Inn of Klein Baschwitz, crossing the road from Wurtchen to Bautzen.

The enemy was obliged to uncover his right, to prepare for this new attack. The Prince of Moskwa took advantage of it by advancing in front. He took the village of Preisig, and having come up with the enemy's army, marched on to Wurtchen. It was three o'clock in the afternoon, and whilst the army was in the greatest incertitude of success, that a heavy firing was heard along a line of three leagues, and announced to the emperor that the battle was won.

The enemy finding that his right was turned, his retreat soon became a flight. At seven o'clock in the evening, the Prince of Moskwa, and General Lauriston, arrived at Wurtchen. The Duke of Ragusa then received orders to make an inverse movement to that which the guard had made, occupied all the entrenched villages, and all the redoubts, which the enemy were obliged to evacuate, advanced in direction of Hochkorch, and thus took the enemy's left in flank, which then fell into an unavoidable rout. The Duke of Tarentum, on his side, briskly pushed this left wing, and did it considerable mischief.

The Emperor slept on the road in the midst of his guards, at the inn of Little Baschwitz. Thus the enemy being forced from all his positions, left the field of battle in our power, covered with his dead and wounded, and several thousands of prisoners.

On the 22d, at four o'clock in the morning, the French army put itself in motion. The enemy had fled the whole night by all the roads, and in every direction. We had not found his first posts until past Weissenberg; nor did he offer to make any resistance until he had gained the heights in the rear of Reickenbach. The enemy had not yet seen our cavalry.

General Lefebvre Desnouettes, at the head of 1,500 horses of Polish lancers of the Guards, charged and overthrew the enemy's cavalry in the plain of Rettenbach. The enemy believing that these were alone, caused a division of their cavalry to advance, and several divisions were successively engaged. General Latour Maubourg, with his

his 14,000 horse, and the French and Saxon cuirassiers, arrived to their assistance, and several charges of cavalry took place. The enemy, quite astonished to find 15 or 16000 cavalry before him, whilst he believed us to be unsupplied with any, retired in disorder. The corps of red lancers of the Guards is for a great part composed of the volunteers of Paris, and its neighbourhood. General Lefebvre Desnouettes, and General Colbert, their colonel, betowed the greatest eulogiums on them. In this affair of cavalry, General Bruyere, of the light cavalry, and an officer of the highest distinction, had his leg carried off by a cannon-ball.

General Reynier with the Saxon corps gained the heights beyond Rettenbach, and pursued the enemy as far as the village of Hotterndorf.—Night overtook us, at a league from Guerlitz. Although they had been extremely long, we finding ourselves now at the distance of eight leagues from the field of battle, and that the troops had undergone so much fatigue, the French army was to have slept at Goerlitz; but the enemy having placed a corps of their rear guard on the heights in front, and as it would have required half an hour more day-light to turn his left, the Emperor ordered the army to take a position.

In the battles of the 20th and 21st, the Wurtemberg General Franquemont, and General Lorenzez, were wounded. Our loss on these days may be estimated at 11 or 12,000 men in killed and wounded. At seven o'clock in the evening of the day of the 22d, the Great Marshal, Duke of Frioul, being on a small eminence along with the Duke of Treviso and General Kirgener, all three with their feet on the ground, and at a sufficient distance from the fire, one of the last balls fired by the enemy struck down close to the Duke of Treviso, tore the lower part of the Great Marshal, and killed General Kirgener on the spot. The Duke of Frioul immediately felt that he was mortally wounded, and expired twelve hours after. As soon as the posts were placed, and that the army had taken its bivouasque, the Emperor went to see the Duke of Frioul. He found him perfectly master of himself, and showing the greatest sang froid. The Duke offered his hand to the Emperor, who pressed it to his lips. "My whole life," said he to him, "has been consecrated to your service, nor do I regret its loss, but for the use it still might have been of to you!"—"Duroc!" replied the Emperor, "there is a life to come: it is there you are going to wait for me, and where we shall one day meet again!"—"Yes, Sire, but that will not be yet these thirty years, when you will have triumphed over your enemies, and realised all the hopes of our country. I have lived an honest man; I have nothing to reproach myself with. I leave a daughter behind me; your Majesty will fill the place of a father to her." The Emperor grasping the right hand of the Great Marshal, remained a quarter of an hour with his head reclined on his right hand, in deep silence. The Great Marshal was the first who broke this silence: "Ah, Sire," cried he, "go away: this sight gives you pain!" The Emperor, supporting himself on the Duke of Dalmatia, and the Great Master of the Horse, quitted the Duke of Frioul, without being able to say more than these words, "Farewell then, my friend." His Majesty returned to his tent, nor would he receive any person the whole of that night.

On the 23d, at nine o'clock in the morning, General Reynier entered Goerlitz. Bridges were thrown over the Neisse, and the army crossed that river.

On the 23d, in the evening, the Duke of Belluno was near Botzenburg; Count Lauriston had his head-quarters at Hochkerch; Count Reynier before Trotskendorf, on the road to Lauban; and Count Bertrand in the rear of the same village; the Duke of Tarentum at Schoenberg, and the Emperor at Goerlitz.

A flag of truce, sent by the enemy, brought several letters; from which, it is believed that he wishes to negociate for an armistice.

The enemy's army has retired by the road of Branzlau and Lauban, in Silesia. All Saxony is delivered from her enemies; and by to-morrow, the 24th, the French army will be in Silesia.

The enemy has burnt a great quantity of his baggage, blown up a number of parks, and distributed through the villages great quantities of wounded. Those whom he was able to take away in carriages had not their wounds dressed; the inhabitants make their numbers upwards of 18,000; and more than 10,000 remain in our power. The town of Goerlitz, which contains 8 or 10,000 inhabitants, has received the French as their liberators. The City of Dresden, and the Saxon Ministry, have shown the greatest activity in providing for the army, which has never had a greater abundance of every thing.

Although great quantities of ammunition have been consumed, yet the workmen of Torgau and Dresden, and the convoys which arrive through the attention of General Sorbier, keep our artillery well provided.

We have received intelligence from Glogau, Custrin, and Stetting. All those places are in good condition.

The recital of the battle of Wurtchen can only be considered as a sketch. The General Etat Major will collect the reports, which will make known such officers, soldiers, and corps, as have distinguished themselves.

In the small combat of the 22d, at Reitenbach, we ascertained that our young cavalry

valry is superior to that of the enemy, in equal numbers.

We could not take any colours, as the enemy never brings them on the field of battle. We have only taken 19 cannon, the enemy having blown up his parks and caissons; and, besides, the Emperor keeps his cavalry in reserve, until it is of sufficient numbers: he wishes to spare it.

A Brief DISCOVERY *of the* TRUE MOTHER *of the pretended* PRINCE *of* WALES, *known by the Name of* MARY GREY.—*To which is added, A further Discovery of the late Conspiracy against his Majesties Sacred Person, and Government, &c. as laid before the King, &c. and Deposed to a Committee of Parliament. By William Fuller, gent. sometime Page of Honour to the late Queen in France. London: Printed for the Author, Anno Dom.* 1696.

(Concluded from page 425.)

NOW to return to my last coming from France with Mr. Crone, I having informed his Majesty of all I knew, Mr. Crone was seized, and sent prisoner to the tower, the rest of the conspirators and their designs being known, and narrowly observed, his Majesty went for Ireland, committing the management to the queen, and the ministers of state: yet, although the jacobites, and the French court were, blessed be Almighty God, disappointed of the king's being kill'd on his journey to Ireland, they continued to go on with their other designs; Colonel Parker being also order'd for Ireland, to kill his Majesty there; but the government knowing their intriegues, took care to secure this kingdom, by raising the militia, and securing of conspirators, before the French fleet came on our coast, as they did, and lay some time, expecting to hear of their friends in England, being in arms to receive them. At this time several lords, and others, were sent to the tower, and others whose intriegues were discovered, fled from justice, which occasioned several proclamations to be published for apprehending them; and the tower, and all the goals in London, and several others were filled with conspirators. They finding their whole design unravelled, and that I had discovered all I knew, and Mr. Crone was safe, and to be suddenly tryed, which might make him confess, they instantly got me poysoned, in hopes to have prevented Crone's tryal; but it pleasing Almighty God to restore me to my health again, after ten weeks sickness, I was able to come to the Old Baily, where Mr. Crone was tryed, and condemned for high treason; he had several reprieves from time to time, on his promise of making a full confession; but as he was lingring it out, about six months after his conviction, I receiv'd a letter at my lodgings in Pall-mall, from the Earl of Melford, King James's secretary, in which I was promised King James's pardon, and all the favour I could desire from him, and the court of France, and five hundred pounds down, if I would return to France, and recant from what I had done: I carried this letter to the king, who sent me to the Lord Chief Justice Holt, for his advice, how far I might proceed by law, thinking thereby to discover something more; but his lordship and several others were of opinion, that it was a trick, purely to invalidate my evidence; they still being apprehensive of Mr. Crone's confession, which they knew must be so agreeable to my informations, that the heads of King James's friends had been intirely at King William's mercy: and this matter highly concern'd the French court; for, had Crone been just to him that gave him his life, there might have been but small encouragement from England to the French long since; and consequently, no plotting now. They of King James's party (as well has appeared to the court) made it their endeavour to have Crone hang'd, to stop his mouth; and that, as I am well informed, occasioned his making almost a full discovery: though he went for France as soon as he was let out of Newgate, being invited back with great promises, as I before had been, I must thank him for his justice to me, in his last, and most authentick confession: he affirms on oath, that all my information was true; for the confirmation of this, I can appeal to any member of parliament that heard Mr. Crone's, or the Lord Preston's confessions read, before the honourable House of Commons. After this, it may seem strange to some, how the house came to be so angry with me: I beg leave to inform such, that the jacobites, by Mr. Crone's going off, knew they had partly secured themselves from the just power of the law; but were yet concern'd, if possible to make the world believe, that they never had any design against the government: and who can blame them for being ashamed of such a horrid and bloody design, as they had then contrived against the government and their own countrey, to ruine both church

church and state? To cover their shame as much as may be, they had no way but to invalidate me; which they set about with all the malice that the devil, or Popish principles cou'd incite them with; though for some time my faithful service, and the king's large promises of lasting favours to me, was my support; and had continued so, but that the immaturity of my judgment was so easily impos'd upon, by two instruments sent by the French court, to accomplish my ruin, viz. Colonel Thomas Dalleval, and Mr. George Hayes: they were formerly my most intimate acquaintance, both in England and at the court at St. Germains, and were imployed constantly 'twixt England and France on King James's account, as I was: the first of these came to me at my lodgings in White-Hall, and told me, he desired to come and serve the government, as I had done, provided I wou'd intercede with the queen for his pardon, and make some conditions for his coming over honourably. I acquainted the queen of it immediately, the king being then in Flanders; and her majesty, (whose bounty extended to all) did most graciously promise to write to the king about it; and, in the mean time, committed the management of this affair to the care of his grace, John Lord Arch-Bishop of Canterbury, (my very good friend). But before the king's answer came from Flanders Dalleval received a letter from the Earl of Melfort, requiring his return immediately to St. Germain's; which letter he shewed me, and I carried it to the queen, who knowing Melfort's hand, gave orders, that Colonel Dalleval might go for France again, provided that he engaged to return when her majesty required him: all which he swore, and promised most solemnly to do, and then went for France accordingly: soon after his arrival there he sent me several letters writ in characters, promising to come to King William in Flanders, and desired me to meet him there. The arch-bishop and my self from time to time acquainted her majesty of every particular; and I was commanded to go for Flanders, where I continued with the king three months on this occasion, and receiv'd letters from Colonel Dalleval at St. Germain's twice every week, during the time I was there; the contents of which letters proved very true, and of some use at that time to the king's affairs; but this was only a snare, the more securely to ruin me to the purpose: for, as soon as the king came to England, and the parliament was sitting, Dalleval writ to me, and Mr. Hayes likewise, to have me get their pardon, and protection from the king and parliament, promising they would make great discoveries, (which his majesty knew they might, this being the winter before the second intended invasion, when the forces with the late King James lay at La-Hogue, ready to embark the latter end of April following) the parliament having addressed the king to cause the Lord Preston's and Mr. Crone's confessions to be laid before them, and their's agreeing with mine, the parliament made an humble address to the king, to add to his bounty to me; this did more inflame mine and the nation's enemies; and Colonel Dalleval and Mr. Hayes sent me abundance of letters, and great promises of performing considerable services for their majesty's and this kingdom's safety. At length I did address the House of Commons in their behalf, desiring a pardon and passport to be given me blank, for two gentlemen to come from beyond the seas, and to return if desired; the honourable house granted my request, on condition I would engage for their appearance, and performing what they promised at this time. Only their majesties, and some of their most honorable privy council, knew these men's names that I engaged for, lest the French court shou'd prevent their coming, (as my credulity caused me to believe,) I had the protection of the parliament for them, and a pardon and passport signed by the king, and under the great seal; it was left blank for me to fill up; and this I sent for Flanders, by a messenger of my own, recommended by some members of parliament; it proving very cold hard weather in those parts, Dalleval and Hayes came to Antwerp some time before my messenger could get there; so they went to Ostend, and came from thence to England, having heard their pardon had passed the seals. The messenger heard of them at Antwerp, and other places; and hearing they were come for England, he returned. As soon as Dalleval and the other arrived, they sent one Jones to me with a letter, assuring me they were coming to town, and intended to attend on the House of Commons the Monday following. I was extream joyful to hear of their arrival, and immediately sent their letter to the house, where the speaker read it; and Monday was appointed for hearing them. At this unhappy time, I was very dangerously sick, and when Monday came the gentlemen

men were seen by many in the lobby, whilst the house was at prayers: but prayers being ended, and they called for, they were vanished of a sudden, which occasioned the house to appoint a committee to come to me, which they did, taking all my papers and informations on oath; Anthony Bowyer, esq. being chairman of the said committee: I gave them an account where Mr. Hayes had lodged formerly at a papist's in Holbourn, but they were not to be found; which occasioned on Wednesday the 24th of February to pass a vote against me, and to address the king to order the attorney-general to prosecute me for engaging for these men, and that they did not appear. Now King James's friends had their desire, and Dalleval, with the other, having accomplisht their villainous designs, returned for France. I was brought to my tryal, at my own request, at the King's Bench, at Westminster; and even then these gentlemen, Dalleval and Hayes, sent me several letters to excuse themselves, and promised to come and vindicate me: and it is most certain, that even to this time they have continued to come frequently to England about King James's business. When I was on my tryal, the attorney-general, now lord-keeper of the great seal, and one of the lords justices of England, told the judges and jury, that I had performed very considerable services to the advantage and security of the present government, and had discharged my duty honestly; but having engag'd for those men, and they not appearing, occasioned my tryal; on which I produced a certificate, under the hand of his Grace the Duke of Shrewsbury, that by the king's order, and his encouragement, I was sent to France for the service, and security of the present government, as before mentioned.

I also desired the Lord Chief Justice Holt to acquaint the jury, (who were all gentlemen of good account) of what he knew, being one of his majesties most honourable privy-council. And, as to the matter relating to the letters I had, and the pardons, and money which was offered me to go back for France, all which his lordship most justly and honourably declared: there was likewise a considerable number of members of parliament call'd; but the men I engaged for, not appearing before the house, to certifie them, I was found guilty of a misdemeanour against them.

Having thus shewed how far their malice extended to me, I beg you will take notice, how confidently King James's friends can oppose any truth that is against their interest, as now their denying, that the French court, or King James's knew of the design of murthering King William; when the world cannot but remember that Chevalier Granval was executed in Flanders, for endeavouring to shoot the king; and that, at his death, he confess'd the fact; and it was sufficiently prov'd, that Colonel Parker was engag'd with him; and that Parker had receiv'd instructions from the late king; and that both of them, with others, were encouraged from time to time, by the French ministers of state: of this I first acquainted his majesty, but it was further discovered, at one of the confederate prince's courts, who earnestly pressed his majesty to examine the matter; and, being done, this Granval was found guilty, and executed; tho' Colonel Parker made his escape: which may convince any thinking man, that from the first intended invasion from France, that court has studied wayes to kill King William, and his late royal consort, of ever blessed memory.

As for the intolerable injuries that I have undergone, time, and their own devices have at last demonstrated; tho' they spared for no means that might make me obnoxious to all good men: I bless God, and must acknowledge the abundant goodness of my sovereign, for my deliverance from their treacherous and base villanies; and earnestly pray, that Almighty God will forgive them, as I most freely do.

Whoever shall peruse these lines, and is not satisfied with the truth of any particular, I shall be ready to give any demonstration, that is not too impertinent. And as I have mentioned the names of several great and good men, I dare refer any person to them, for the confirmation of the truth of this narrative.

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